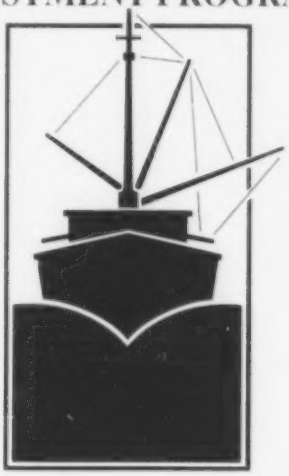
COD TRAP MESH SELECTIVITY STUDY
1991

ATLANTIC FISHERIES
ADJUSTMENT PROGRAM



PROGRAMME D'ADAPTATION DES
PÊCHES DE L'ATLANTIQUE

NEWFOUNDLAND REGION

GEAR CONVERSION — PROJECT REPORT 1991 - 182

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Canada

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COD TRAP SELECTIVITY STUDY
1991

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Summary

Six cod trap mesh size selectivity projects were carried out in the Newfoundland Region during the summer of 1991 in the following locations:

(1) Petty Harbour - Two Japanese cod traps were monitored, one with 102mm mesh and the other with 92mm mesh. Both traps were surrounded by 64mm mesh retainers to capture the fish which escaped through the 102mm and 92mm meshes.

(2) Renews - One Japanese cod trap was fished with 102mm mesh. A 76mm mesh retainer extended from the back of the trap to catch the fish which escaped through the 102mm mesh.

(3) Fogo - One 102mm mesh Modified Newfoundland trap, two Newfoundland traps (one with 92mm mesh and one with 102mm), and two Japanese cod traps (with 92mm mesh) were monitored.

(4) Square Island, Labrador - Two 92mm mesh Newfoundland traps were monitored.

(5) Torbay - Six modified Newfoundland traps were monitored, each with 92mm mesh in the back,

(6) Lord's Cove - Three Newfoundland traps were monitored, each with 92mm mesh throughout the traps.

The study results indicated that increasing the mesh size from 92mm to 102mm in cod traps will reduce the amount of small cod caught. For the purpose of this report small fish refers to fish with a fork length of 41cm and under. The 102mm mesh traps allowed between 32.5% and 40% of catch to escape. 74% of the catch which escaped from the

102mm trap in Petty Harbour was cod fish 41cm and under in length, while only 65% of the catch which escaped from the 102mm trap in Renews was 41cm and under in length.

The amount of cod meshing in the drying twine was found to be related to the size distribution of the fish populations in the area. Study results indicated that the fish which meshed in the 92mm mesh were between 35.6cm and 41.9cm. Most of the fish which meshed in the 102mm mesh were between 40.1cm and 47.7cm.

The average fish length caught in the 92mm traps was 38.72cm, while the average fish length caught in the 102mm traps was 47.19cm.

The study concluded that the 102mm mesh caught less small cod than the 92mm mesh.

1.0 Introduction

The cod trap has traditionally been an important component of the Newfoundland inshore fishery. With its minimum mesh size of 89mm, the cod trap has caught substantial amounts of small fish (fork length - 41cm and under). Anticipating the benefits of reducing the catch of small cod, several studies have been carried out on mesh size selectivity in cod traps. This study was funded under the Gear Conversion Component of the Atlantic Fisheries Adjustment Program (AFAP).

In 1990, a study regarding the "Effect of Mesh Size and Shape on the Selectivity of Cod Traps" was carried out in eight locations around Newfoundland, (Brothers Et Al 1990). The project concluded that (i) increasing the mesh size from 89mm to 102mm would significantly reduce the catch of small fish, (ii) increasing the mesh size did not appear to result in increased meshing problems, and (iii) the use of square mesh versus diamond reduced the amount of immature fish caught.

Although cod traps constructed in 1990 with square mesh of the same mesh size as diamond mesh caught fewer small fish, the use of square mesh cod traps was not continued this year. This was mainly because the approximately 4,500 commercial cod traps used in the Newfoundland Region have diamond mesh and every effort is being made to improve the selectivity of diamond mesh traps before square mesh is further investigated.

In 1991, the Industry Development Division, Fisheries and Habitat Management Branch, conducted six (6) cod trap mesh size experiments in selected areas from Lord's Cove on the Burin Peninsula to Square Islands, Labrador (Figure 1).

The main purpose of this study was to determine the effect which various mesh sizes in cod traps have on the amount and size of fish which are caught, meshed and escape from cod traps.

The mesh size, fish weight and fish length measurements recorded in this report are in the metric system (Table 1). Conversion to the imperial system for the most common measurements used is as follows:

TABLE 1

CONVERSION FROM METRIC TO IMPERIAL SYSTEM

MESH SIZES	FISH LENGTHS (Fork Lengths)
64mm - 2 1/2"	28cm - 12"
76mm - 3"	33cm - 13"
89mm - 3 1/2"	35.5cm - 14"
92mm - 3 5/8"	38cm - 15"
102mm - 4"	40.5cm - 16"
127mm - 5"	43cm - 17"
178mm - 7"	45.5cm - 18"
	48cm - 19"

To convert the weight of fish from kilograms to pounds, multiply the weight by 2.2.

Mesh size is the distance between the extreme angles of a single mesh measured inside the knots and after being stretched to form two parallel straight lines.

LOCATIONS OF COD TRAP MESH SIZE SELECTIVITY STUDY

Figure 1

2.0 Methodology

Different types of cod traps with various mesh sizes were monitored in six (6) locations throughout the Newfoundland Region (Figure 1). The study had two separate objectives. The first objective, which encompassed the projects in Fogo, Square Islands, Torbay and Lord's Cove, was to determine the effect which various mesh sizes in cod traps have on the amount and size of fish which become trapped and meshed in cod traps. The projects in Petty Harbour and Renews included the first objective and also had a second objective which was to determine the effect which various mesh sizes have on the size and amount of fish which escape from cod traps.

The three most common trap designs used in Newfoundland and Labrador to catch cod are: the Newfoundland trap, the Modified Newfoundland trap, and the Japanese trap. All three types of traps were monitored during this study.

The Newfoundland trap is usually 100 to 140 meters in circumference and 18 to 30 meters deep. The mesh size in the front and forward half of the sides and bottom is usually 127 to 165mm, and 89 to 92mm in the remaining half of the sides, bottom and back (drying twine).

The Modified Newfoundland cod trap is usually constructed the same size in circumference, the same depth, and the same mesh size as the Newfoundland trap. The only difference is in the front of the trap. The Newfoundland trap is straight across the front with one to one and one-half meter openings (doorways) on each side of the leader. The Modified Newfoundland trap has the doorways turned in (winker panels) three to four

meters. This modification is made to prevent fish from escaping.

The Japanese trap is usually 100 to 110 meters in circumference and 14 to 18 meters deep. A flapper net (funnel) divides the trap in two compartments. The front or winker section is made from 127mm mesh, while the main body or box is made from 89 or 92mm mesh. The trap is usually operated with a 102 to 127mm mesh roof.

The Japanese cod traps used in the Petty Harbour are different than those most commonly used throughout Newfoundland and Labrador. They are 14.6 meters deep at the front and the sides are tapered up from the bottom 3.6 meters. The main body of the trap is 11 meters deep. Mesh size and other parts of the trap are similar to the common Japanese trap.

The mesh size in many Newfoundland and Modified Newfoundland traps have been changed in recent years to 89 or 92mm throughout.

Although the trap design improves the ability of a trap to catch and hold fish, there is no indication that the trap design have any relationship to the size of fish caught by the trap. This is a direct result of the mesh size in the trap.

Cod traps which were monitored in Petty Harbour and Renews were equipped with small mesh retainers outside the trap walls to catch the escaping fish. The traps monitored at the other locations were not equipped with retainers.

Sea Watch, a division of Beothuk Data Systems Limited, was awarded a contract to provide a project monitor at each of the six locations. The project monitors were equipped with measuring boards to measure the 'fork length' of fish. ('Fork length' being the body dimension from the front tip of the mouth to the base of the arc in the tail).

The project monitors performed the following functions:

(a) took random samples of 200 meshed fish from designated sections of the back and sides of each trap and recorded their lengths,

(b) recorded the total weight of fish meshed in the designated sample sections,

(c) recorded the total weight of each catch,

The results of these samples were recorded on length frequency forms (Appendix B). These data were recorded from each trap after every haul. Each project monitor was also required to submit a final report to the project coordinator.

3.0 Data Analysis

The samples recorded by project monitors were analyzed for individual traps to determine relationships between cod trap mesh size and the length of fish trapped. It was assumed that in any one area all traps were exposed to equivalent frequency distributions of fish with respect to length. Therefore, any significant differences in the length frequencies of trapped fish amongst the various traps in an area were attributed to differences in trap mesh size.

In a similar manner, the samples helped determine the effect of mesh size on the length of fish meshed and the amount of meshing that occurs. It was also possible to determine the amount of small fish escapement in traps which were operated with retainers.

Selectivity curves were developed for the traps that were equipped with retainers (Petty Harbour and Renews). These data were analyzed in conjunction with the average size distribution of fish trapped in each location. It determined how effective each trap was at releasing small fish. Cumulative Length Frequency graphs were constructed for traps monitored at the remaining four locations. These graphs show the cumulative percentage of fish caught at various fish lengths.

Tables and graphs were developed which compare the fish size in samples taken from traps with the same mesh sizes to fish sizes in samples taken from traps with different mesh sizes. Also recorded is the percentage of small fish (41cm and under) caught by each trap.

4.0 Results

The results contain a description of each of the cod traps used and an account of the fishing performance for each trap. The mesh size in 'Type of Trap' column, Table 2 refers to the mesh size in the back of each trap (drying twine) and not necessarily the largest mesh.

The catch of each trap includes both fish which were trapped in the box and fish which were meshed in the back of each trap unless otherwise stated.

The total weight of the catch in Table 2 includes fish which were trapped and meshed in each respective trap. A total of 449,684 kgs. of cod fish were caught during the 298 times the 19 cod traps were monitored. This was not the entire season's catch by those traps, but only the catch during the period each trap was monitored.

Table 3 gives a comparison between the different cod trap mesh sizes and the average length of fish caught by each trap.

The percentage of small fish (41cm and under) (Table 4) caught by each trap was calculated by taking the total number of fish in each sample (trapped in the box plus fish meshed in the back) and dividing it by the number of fish in each sample which were 41cm and under.

The six cod traps monitored in Torbay were all modified Newfoundland traps with 92mm mesh size throughout. Therefore, the length frequency for all six traps was combined before the percentage of fish 41cm and under was calculated. Table 4 also shows that 86.7% of the fish caught in the six traps were 41cm and under. This was the highest percentage of small fish caught in all the locations monitored. The traps in Torbay were treated with tar to preserve the netting. It is not known if this had any effect on the retention of small fish. The size of fish in the population around Torbay may also be the reason for the catch of small fish.

The 16 cod traps which were monitored during the survey were divided into four categories as follows:

1. 102mm mesh in back and larger in sides

2. 102mm mesh in back and 102mm mesh or smaller in sides
3. 92mm mesh in back and larger in sides
4. 92mm mesh throughout

The total catch of fish from the traps in each category and the average length of fish is shown in Table 3.

The average length of fish trapped, meshed in the drying twine, and trapped in the retainer varied between cod trap mesh sizes, and locations fished (Table 5). This was not influenced by cod trap design. For example, two traps (F1 and F2 of the same design and mesh size were monitored in Fogo. The total catch from both traps were similar; 6124 kgs. compared to 5737 kgs. However, the average fish size in one trap was 6.16 cm larger than the fish in the other trap (Table 3).

Traps monitored with 102mm mesh in the backs and larger mesh size in the sides caught the largest average fish size (47.73cm). These were followed by traps with 92mm mesh in the back and larger mesh size in the sides (47.46cm). As expected, the average length of fish caught in traps with 92mm mesh throughout was the smallest. This would change from 38.72cm to 46.01cm if the large catch of small fish in the Torbay traps was removed from circulation.

Appendix A contains the length frequency results of fish which were trapped and meshed in various sections of each cod trap monitored.

Table 2

Catch Summary

LOCATION	TYPE OF TRAP	TRAP TYPE CODE	NO. OF HAULS	*TOTAL CATCH(kgs)	
				TRAP	RETAINER
Petty Harbour	92mm mesh Japanese cod trap with 64mm mesh retainer	P1	4	10,170	165
Petty Harbour	102mm mesh Japanese cod trap with 64mm mesh retainer	P2	9	12,740	6,134
Renews	102mm mesh Japanese cod trap with 76mm mesh retainer	R1	12	19,037	12,692
Fogo	102mm mesh modified Newfoundland cod trap	F1	22	6,124	
Fogo	102mm mesh Newfoundland cod trap	F2	23	5,737	
Fogo	92mm mesh Newfoundland cod trap	F3	28	3,444	
Fogo	92mm mesh Japanese cod trap	F4	15	5,633	
Fogo	92mm mesh Japanese cod trap	F5	9	6,022	
Square Island	92mm mesh Newfoundland cod trap	S1	43	9,280	
Square Island	92mm mesh Newfoundland cod trap	S2	28	8,512	
Torbay	92mm mesh modified Newfoundland cod trap	T1	36	82,873	
Torbay	92mm mesh modified Newfoundland cod trap	T2	25	79,289	
Torbay	92mm mesh modified Newfoundland cod trap	T3	13	42,911	
Torbay	92mm mesh modified Newfoundland cod trap	T4	8	45,133	
Torbay	92mm mesh modified Newfoundland cod trap	T5	10	48,762	
Torbay	92mm mesh modified Newfoundland cod trap	T6	13	63,958	
Lord's Cove	92mm mesh Newfoundland cod trap	L1	Insufficient fish caught to perform analysis.		
Lord's Cove	92mm mesh Newfoundland cod trap	L2	Insufficient fish caught to perform analysis.		
Lord's Cove	92mm mesh Newfoundland cod trap	L3	2	59	
TOTAL		19	298	449,684	18,991

* Total catch includes round weight of fish which were trapped and meshed in each trap.

TABLE 3

COMPARISON BETWEEN COD TRAP MESH SIZES AND THE LENGTH OF FISH CAUGHT

TRAP TYPE CODE	102mm MESH IN BACK AND LARGER IN SIDES			102mm MESH IN BACK AND 102mm MESH OR SMALLER IN SIDES			92mm IN BACK AND LARGER IN SIDES			92mm MESH THROUGHOUT		
	FISH IN SAMPLE			FISH IN SAMPLE			FISH IN SAMPLE			FISH IN SAMPLE		
	TOTAL #	TOTAL LENGTH (cm)	AVERAGE LENGTH (cm)	TOTAL #	TOTAL LENGTH (cm)	AVERAGE LENGTH (cm)	TOTAL #	TOTAL LENGTH (cm)	AVERAGE LENGTH (cm)	TOTAL #	TOTAL LENGTH (cm)	AVERAGE LENGTH (cm)
P1										881	36,839	41.81
P2				2,207	94,808	42.96						
R1				1,971	102,351	51.93						
F1	4,332	221,307	51.09									
F2	5,186	233,030	44.93									
F3							3,966	181,536	45.43			
F4										3,570	168,657	47.24
F5										2,609	119,354	45.75
S1							8,858	422,768	47.73			
S2							7,275	351,060	48.26			
T										30,877	1,143,922	37.05
TOTAL	9,518	454,337		4,178	197,159		29,129	955,364		37,937	1,468,772	
AVERAGE (cm)			47.73			47.19			47.46			38.72

NOTE: Fish in each sample are the total of fish caught by the trap and fish meshed in the back (drying twine).

The average length of fish caught in traps with 92mm mesh throughout would change from 38.72cm to 46.01cm if the large catch of small fish in the Torbay traps was removed from the calculation.

TABLE 4

COMPARISON BETWEEN COD TRAP MESH SIZE AND THE CATCH OF SMALL FISH (41cm AND UNDER)

TRAP TYPE CODE	102mm MESH IN BACK AND LARGER IN SIDES			102mm MESH IN BACK AND 102mm MESH OR SMALLER IN SIDES			92mm IN BACK AND LARGER IN SIDES			92mm MESH THROUGHOUT		
	# OF FISH IN SAMPLE			# OF FISH IN SAMPLE			# OF FISH IN SAMPLE			# OF FISH IN SAMPLE		
	TOTAL	41cm AND UNDER	% UNDER 41cm	TOTAL	41cm AND UNDER	% UNDER 41cm	TOTAL	41cm AND UNDER	% UNDER 41cm	TOTAL	41cm AND UNDER	% UNDER 41cm
P1										881	478	54.3
P2				2,207	878	39.8						
R1				1,971	98	5.0						
F1	4,332	383	8.8									
F2	5,186	2,130	41.1									
F3							3,966	1,443	36.4			
F4										3,570	1,228	34.4
F5										2,609	1,026	39.3
S1							8,858	1,839	20.8			
S2							7,275	1,507	20.7			
T										30,877	26,756	86.7
TOTAL	9,518	2,513		4,178	976		20,129	4,789		37,937	29,486	
AVERAGE (cm)			26.4			23.4			23.8			77.7

NOTE: Fish in each sample are the total of fish caught by the trap and fish meshed in the back (drying twine).

The % of fish 41cm and under caught in traps with 92mm mesh throughout would change from 77.7% to 38.7% if the large catch of small fish in the Torbay traps was removed from the calculation.

TABLE 5

AVERAGE LENGTH OF FISH TRAPPED, MESHED IN DRYING TWINE, AND TRAPPED IN RETAINER

LOCATION	*MINIMUM MESH SIZE (mm)	AVERAGE SIZE OF FISH (cm)		
		TRAPPED	MESHED IN BACK	TRAPPED IN RETAINER
Petty Harbour (P1)	92	42.18	40.86	36.02
Petty Harbour (P2)	102	42.09	44.76	38.71
Renews (R1)	102	56.53	46.90	40.10
Fogo (F1)	102	54.12	44.71	
Fogo (F2)	102	48.65	40.09	
Fogo (F3)	92	48.76	40.13	
Fogo (F4)	92	51.09	40.08	
Fogo (F5)	92	49.48	39.43	
Square Islands (S1)	92	52.74	41.87	
Square Islands (S2)	92	53.45	42.03	
Torbay (All Traps)	92	38.70	35.63	

* Minimum mesh size in each trap does not include mesh size in retainers or mesh size in bottom of P1 and P2 and the mesh size in the sides and bottom of R1.

4.1 LOCATION: PETTY HARBOUR

The two traps monitored in Petty Harbour were the "D" type Japanese cod traps also known as the Petty Harbour trap (Figure 2). Both traps were 14.6 meters (8 fathoms) deep at the front, and 11 meters (6 fathoms) deep at the back. One trap had 92mm mesh in the back and sides, while the other trap had 102mm mesh in the back and sides. Both traps had a 76mm mesh in the bottom and 127mm mesh in the parlour (winkers). The sides and back of both traps were enclosed by a 64mm mesh retainer to catch the fish which passed through the 92mm and 102mm mesh.

The two cod traps (P1 and P2) were fished from July 19 to August 31, 1991, catching 10,170 kgs. and 12,740 kgs. of cod(catch from retainers not included), respectively (Table 2). Icebergs, strong tides, and high winds affected the performance of the traps. P1 was hauled on only 4 occasions, while P2 was hauled 9 times.

During the project it was observed that the weight of fish which escaped from the 92mm mesh trap was 1.6% of the fish which entered the trap and the weight of fish which escaped from the 102mm mesh trap was 32% (Table 2). However, 54.3% of the fish which were caught (fish trapped in the box plus fish meshed in the back) in the 92mm trap were 41cm and under, compared with only 39.8% of the fish in the 102mm trap (Table 4) (Figure 3 and 4). As expected, the 102mm mesh trap (P2) meshed a larger fish than the 92mm mesh (P1); 44.8cm compared to 40.9cm (Table 5). The average fish length caught in each trap varied slightly: 41.8cm in the 92mm mesh trap, and 43.0cm in the 102mm mesh trap (Table 3).

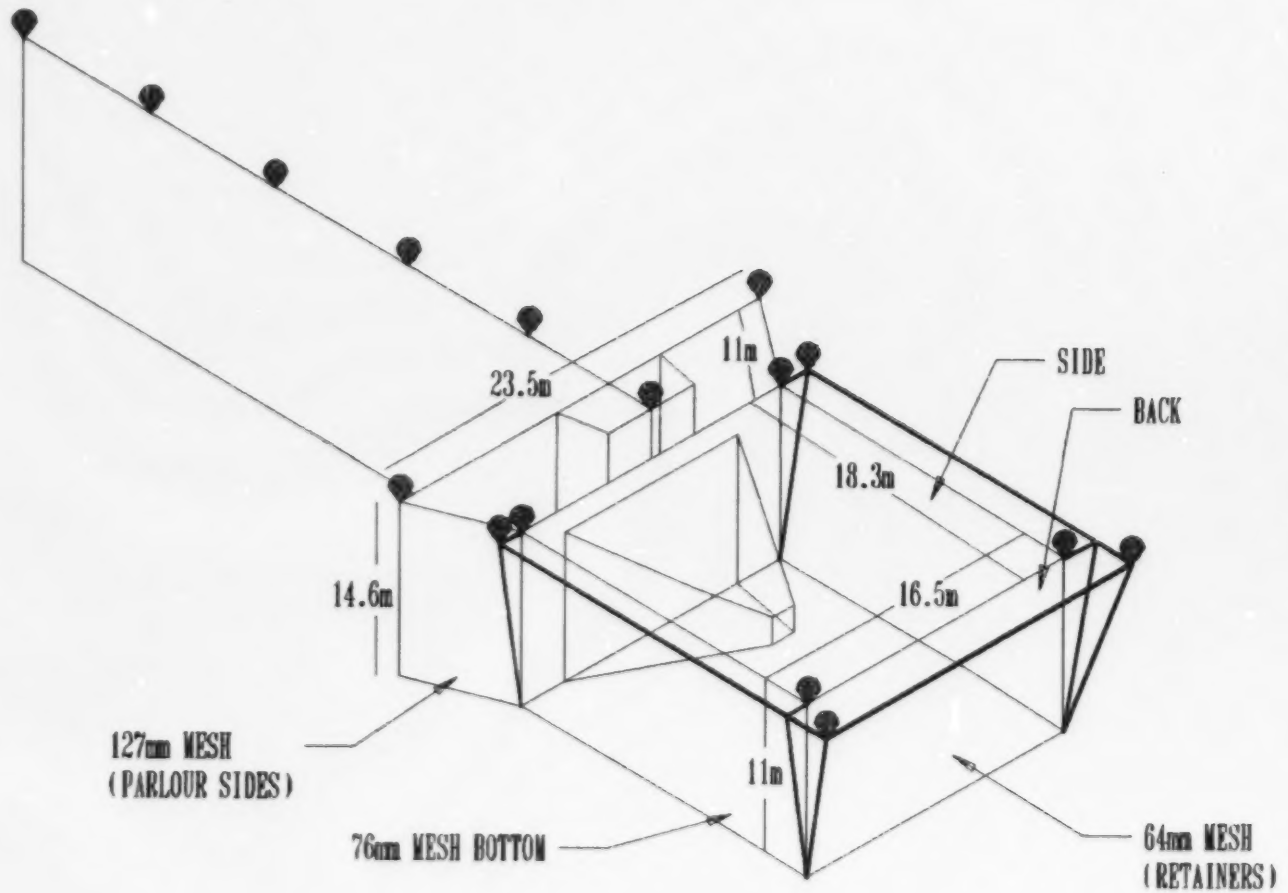
The length frequency distribution for cod caught in a 92mm mesh cod trap compared to a 102mm mesh cod trap is shown in Figure 5.

The trap crew in Petty Harbour observed codfish swimming back and forth through the trap sides and the retainers of both traps. Further studies on cod trap selectivity should not include retainers on the sides.

The cod trap monitored in renews had one retainer attached to the back of the trap, and small mesh in the sides. This trap was much easier to operate.

It is concluded that a small run of fish in the Petty Harbour area was responsible for the large catch rates of small fish in both traps.

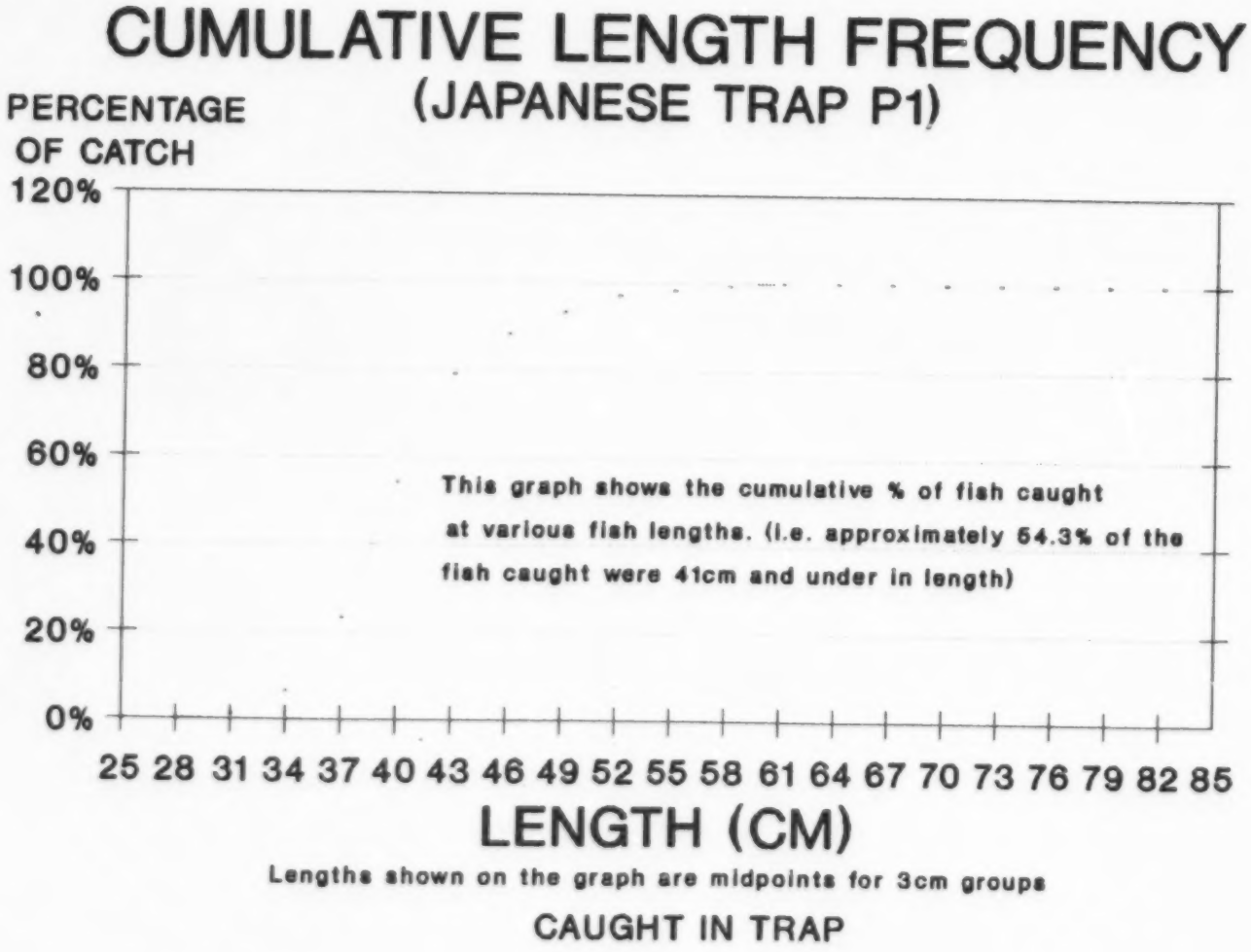
JAPANESE COD TRAP
("D" TYPE)



TRAPS P1 AND P2, PETTY HARBOUR

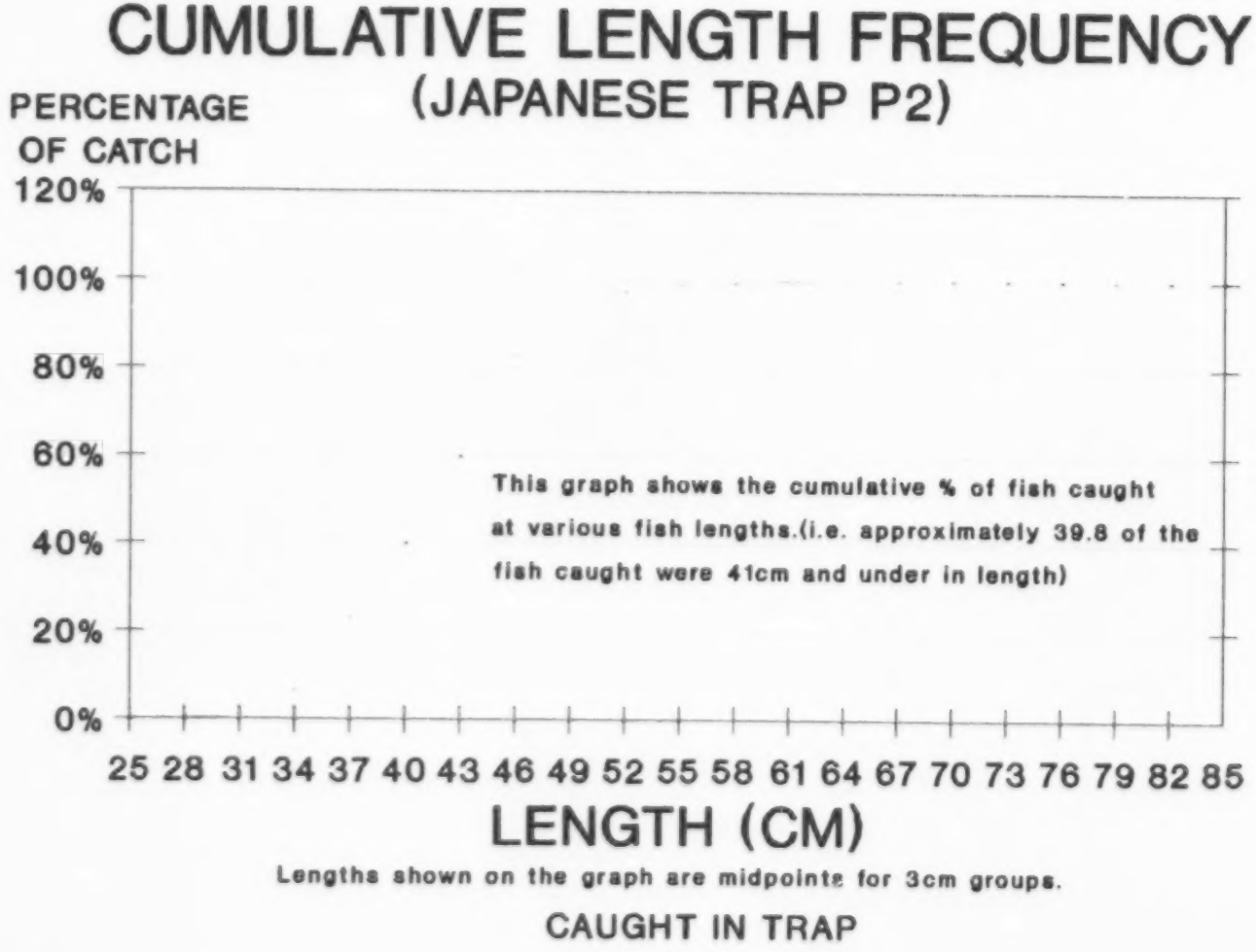
NOTE: RETAINERS ENCLOSING SIDES AND BACK.

Figure 2


CUMULATIVE LENGTH FREQUENCY
(JAPANESE TRAP P1)
PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 54.3% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH, 76mm BOTTOM, 64mm RETAINER

Figure 3


CUMULATIVE LENGTH FREQUENCY
(JAPANESE TRAP P2)
PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths.(i.e. approximately 39.8 of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups.
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH, 76mm BOTTOM, 64mm RETAINER

Figure 4

LENGTH FREQUENCY

P1-92mm, P2-102mm MESH

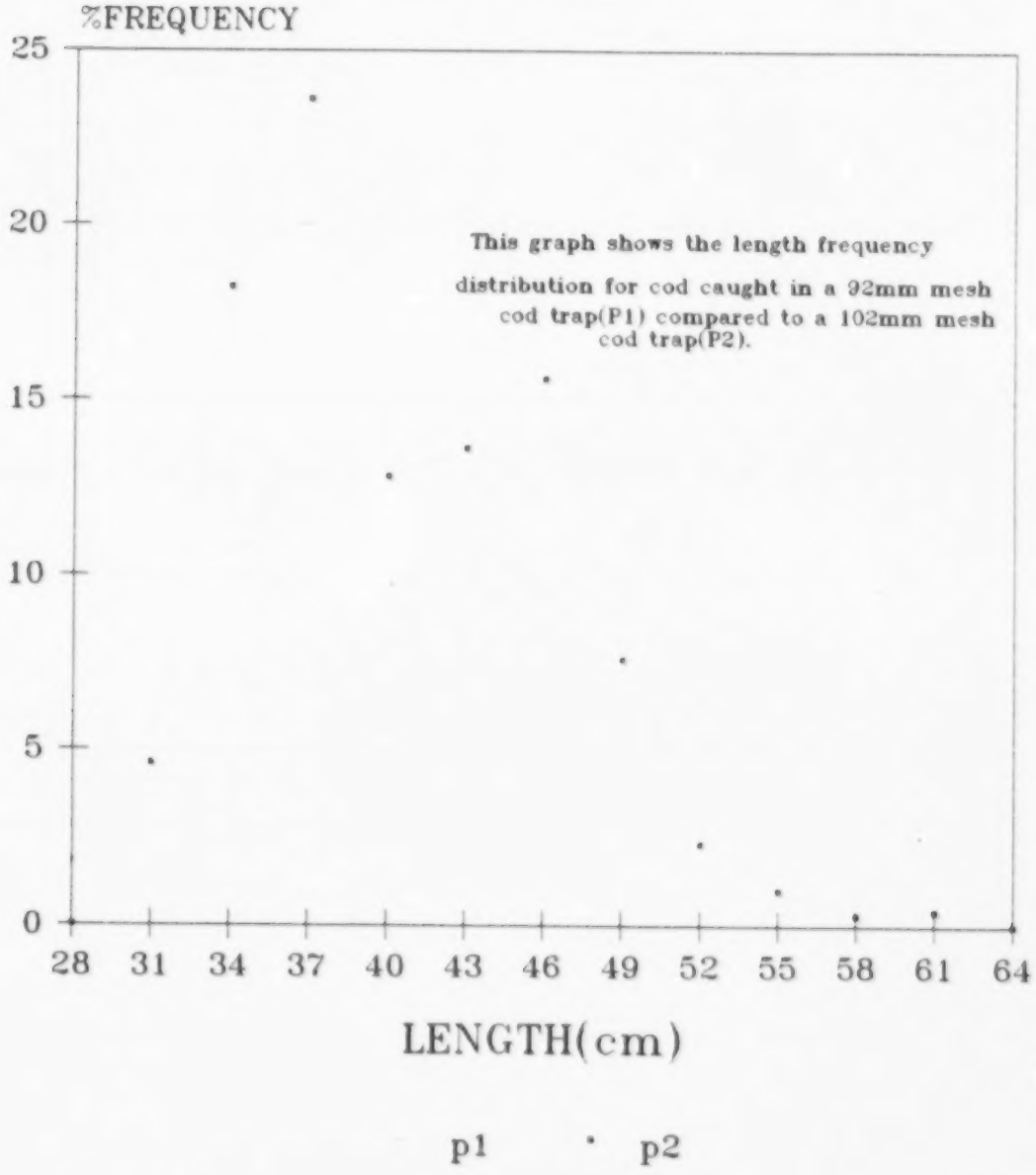


Figure 5

4.2 LOCATION: RENEWS

One experimental Japanese cod trap 102 meters on the rounds and 15 meters deep (R1, Figure 6) was constructed with 76mm mesh in the sides and bottom, and 102mm mesh in the back. A 76mm mesh retainer that extended 3.7 meters from the back of the trap, was attached to retain the fish which passed through the 102mm mesh back section.

The trap (R1) was fished from July 29th to August 22nd and caught 19,037 kgs. of fish (catch from retainer not included). Icebergs, winds and tides posed many problems for the crew. A lot of twine was lost due to bad bottoms and whales. According to the crew the fish were the same size as normally caught in the area.

During the 12 times that the trap was hauled, it was very effective in releasing small fish. Only 5% of the fish caught by the trap were 41cm and under (Figure 7) (Table 4).

Approximately 40% of the traps' catch (determined by weight) escaped into the retainer (Table 2). The average length of the fish meshed in the 102mm back was 46.9cm, while the average length of fish caught in the trap was 56.53cm (Table 5).

The major concern with this trap was the number of fish in the range of 43cm to 61cm that meshed in the 102mm drying twine (Appendix A3). This makes it more difficult to haul the trap, especially when large amounts of fish were in the trap.

JAPANESE COD TRAP

(Model 69 with retainer)

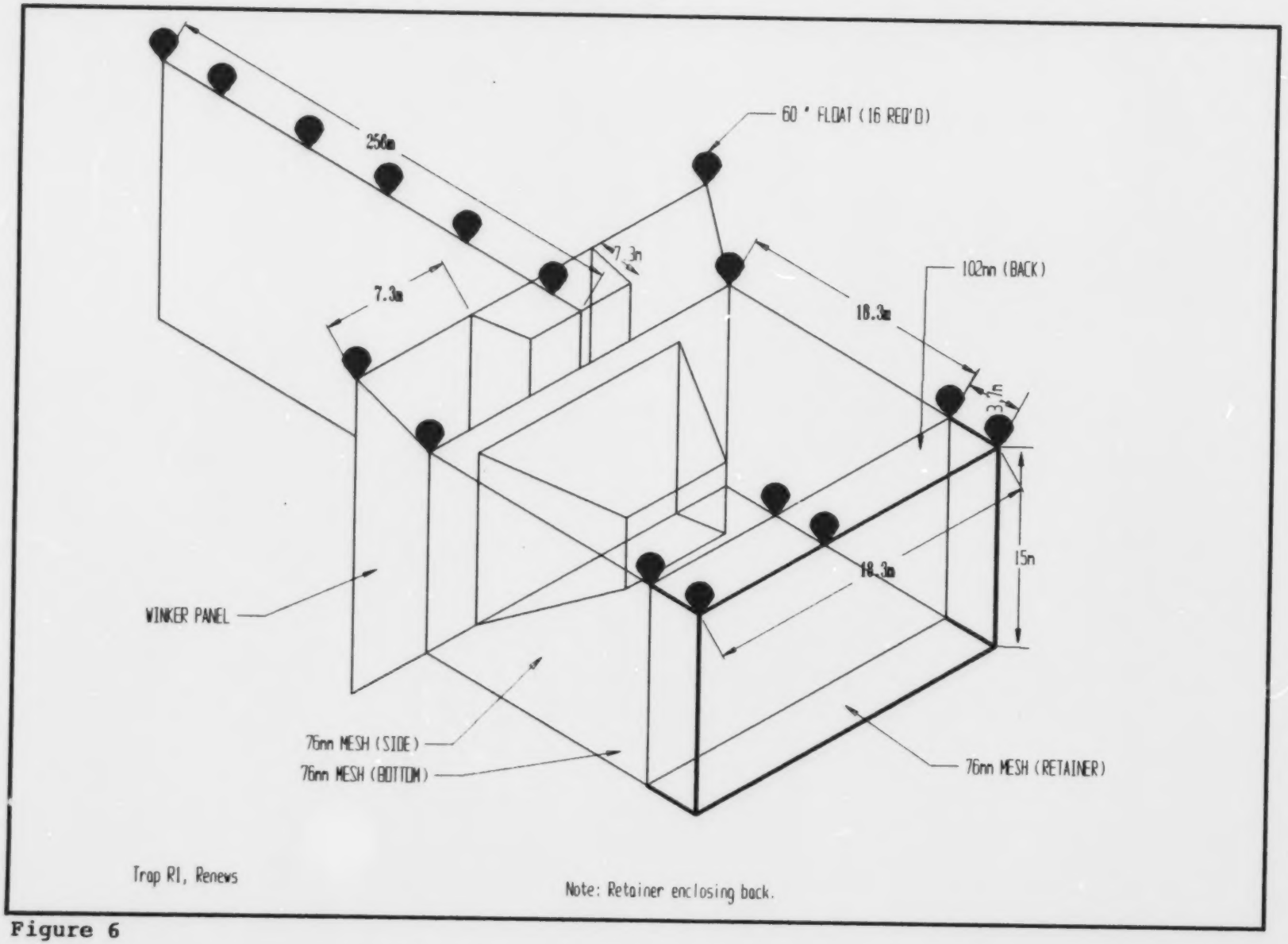
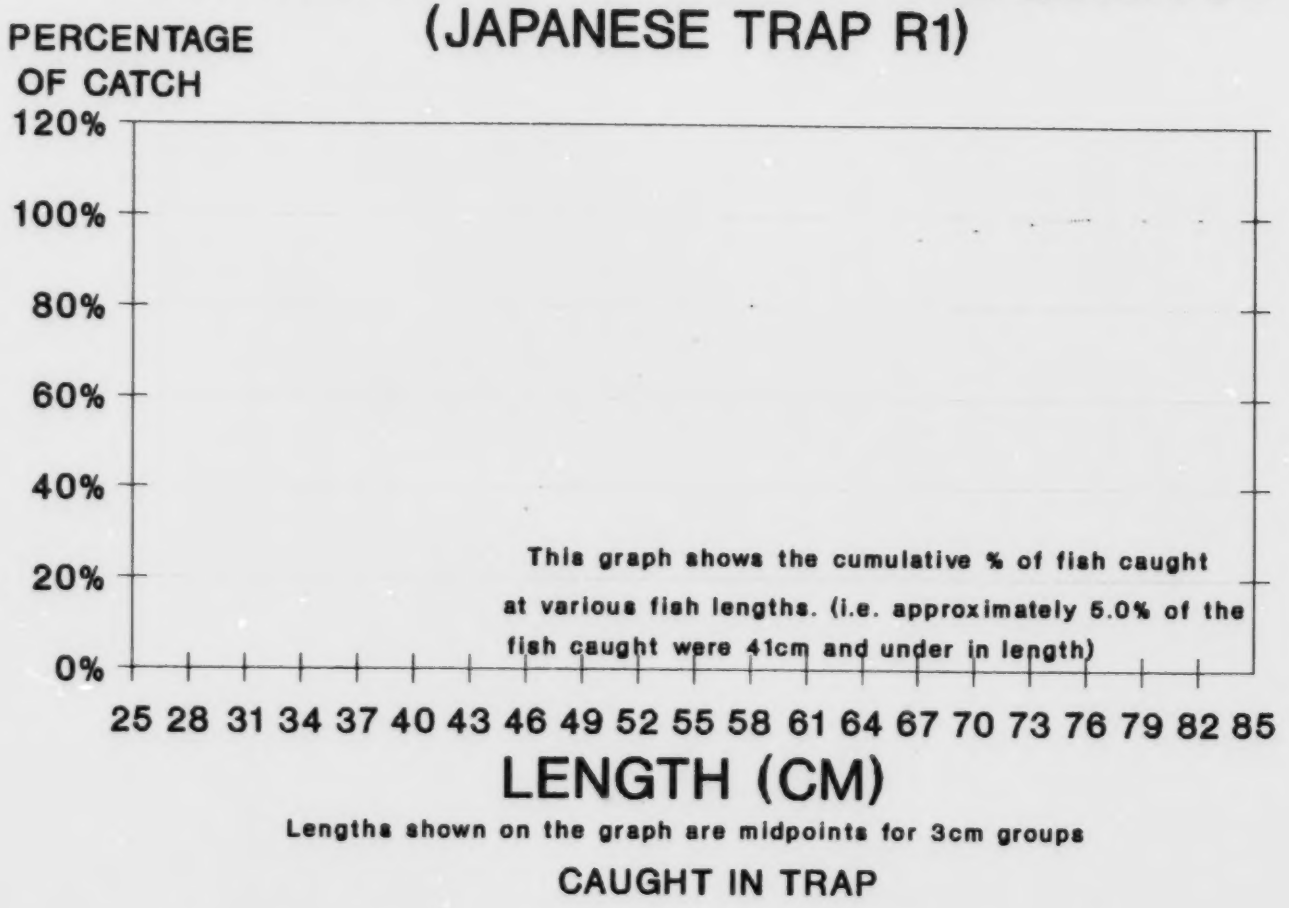


Figure 6

CUMULATIVE LENGTH FREQUENCY
(JAPANESE TRAP R1)


PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 5.0% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
102mm MESH, 76mm SIDES, 76mm RETAINER

Figure 7

4.3 LOCATION: FOGO

One modified Newfoundland trap (F1, Figure 8) with 102mm mesh in the back, 102mm, 127mm and 152mm mesh in the sides; one Newfoundland trap (F2, Figure 9) with 102mm mesh in the back, 102mm, 127mm and 152mm mesh in the sides; one Newfoundland trap (F3) with 92mm mesh in the back, 102mm, 127mm and 152mm mesh in the sides; and two Japanese traps (F4 & F5, Figure 10) with 92mm mesh in the back and sides were fished to collect data on the amount and size of fish caught and meshed in each trap.

The traps were fished from July 25th until September 10th. A total of only 26,960kgs. was caught from the five traps used in Fogo. The average length of the fish caught in the traps was as follows: F1 = 51.09cm, F2 = 44.93cm, F3 = 45.43cm, F4 = 47.24cm, F5 = 45.75cm (Table 3). Differences in the mesh sizes in the Fogo traps was the main reason for the variations in average fish size caught by each trap.

An abundance of inshore crab and five separate occurrences of whales going through leaders in the traps caused unusually high amounts of damage to the gear.

Observations of the traps revealed some interesting information about their fishing efficiency. Selectivity for the Newfoundland cod traps with 92mm and 102mm mesh, and the Japanese cod traps with 92mm mesh was relatively similar with only minor differences between the traps. Figures 11, 12, 13, 14 & 15 respectfully show the cumulative percent of fish caught at various fish lengths. The average fish length meshed in the back of the 92mm traps (F3, F4, F5) was 40.13cm, 40.08cm and 39.43cm respectively, while the average fish length meshed in the back of the 102mm traps (F1 and F2) was 44.71cm and 40.09cm

respectively (Table 5). The average fish length caught in the 92mm traps varied between 51.09cm and 48.76cm, while the average fish length caught in the 102mm traps was 54.12 and 48.65cm. The Japanese cod traps (F4 and F5) had 34.4 and 39.3% of their catch 41cm and under. The 102mm Newfoundland trap (F2) had 41.1% of its catch 41cm and under, while (F3), a 92mm Newfoundland trap had 36.4% of its catch 41cm and under (Table 4).

The modified Newfoundland trap (F1) however, was much more selective. Only 8.8% of the fish caught by the trap was 41cm and under (Table 4) (Figure 11).

The length frequency distribution for cod caught in two 102mm mesh cod traps (F1 and F2) compared to one 92mm mesh cod trap (F3) is shown in Figure 16.

The difference between the length frequency distribution of one 92mm mesh trap monitored in Petty Harbour (P1) compared with two 92mm mesh traps monitored in Fogo (F4 and F5) is shown in Figure 17.

The "D" Type Japanese trap used in Petty Harbour (P1) is designed to be 3.6 meters (2 fathoms) off the sea bed at the back, while the two standard Japanese traps used in Fogo (F4 and F5) are designed to rest on the sea bed. Also, the Petty Harbour trap had 76mm mesh in the bottom and 64mm mesh retainers on both sides and the back. This may be the reason why there was a difference between the length frequency distribution in the same mesh size traps used in Petty Harbour and Fogo (Figure 17).

MODIFIED NEWFOUNDLAND COD TRAP

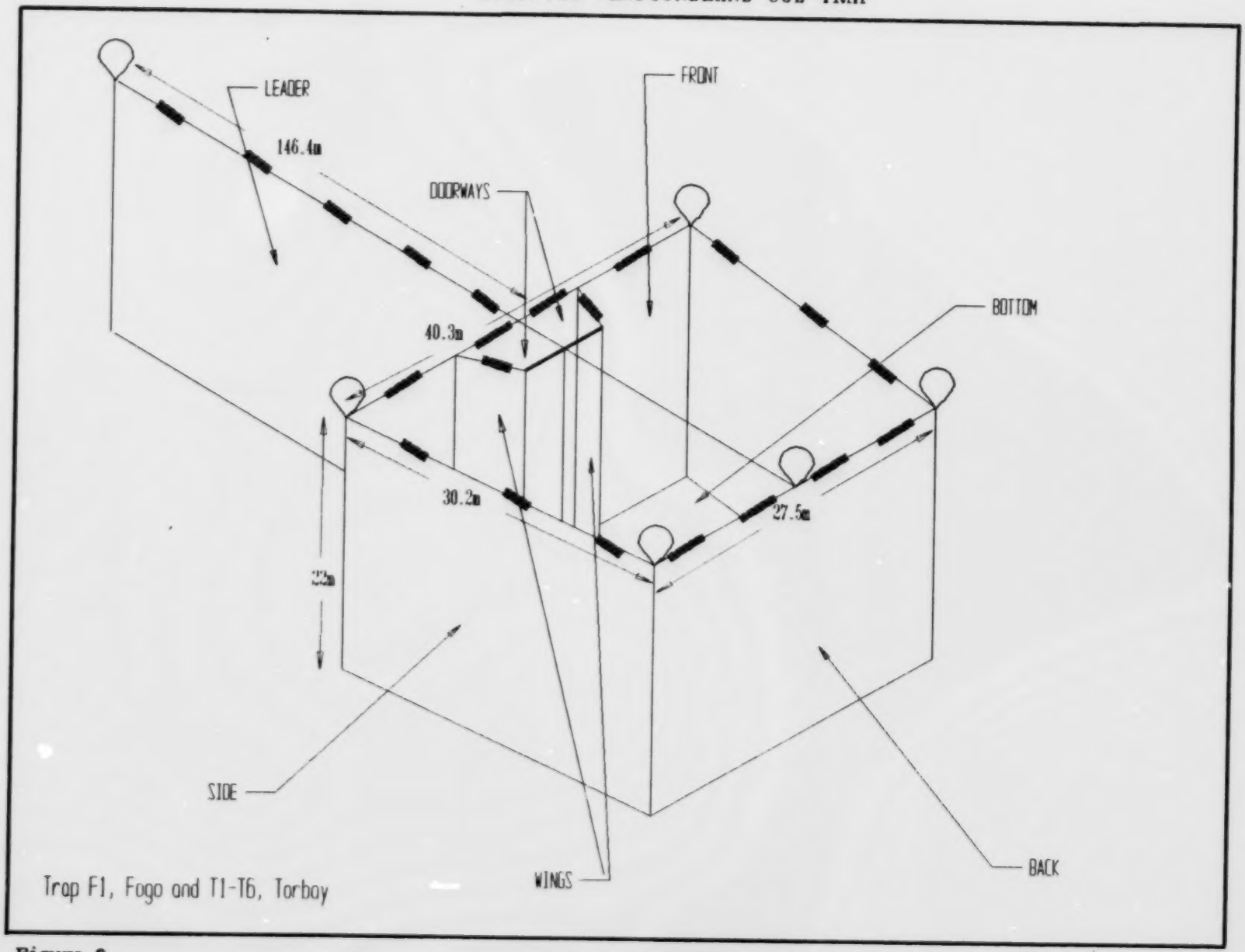


Figure 8

NEWFOUNDLAND COD TRAP

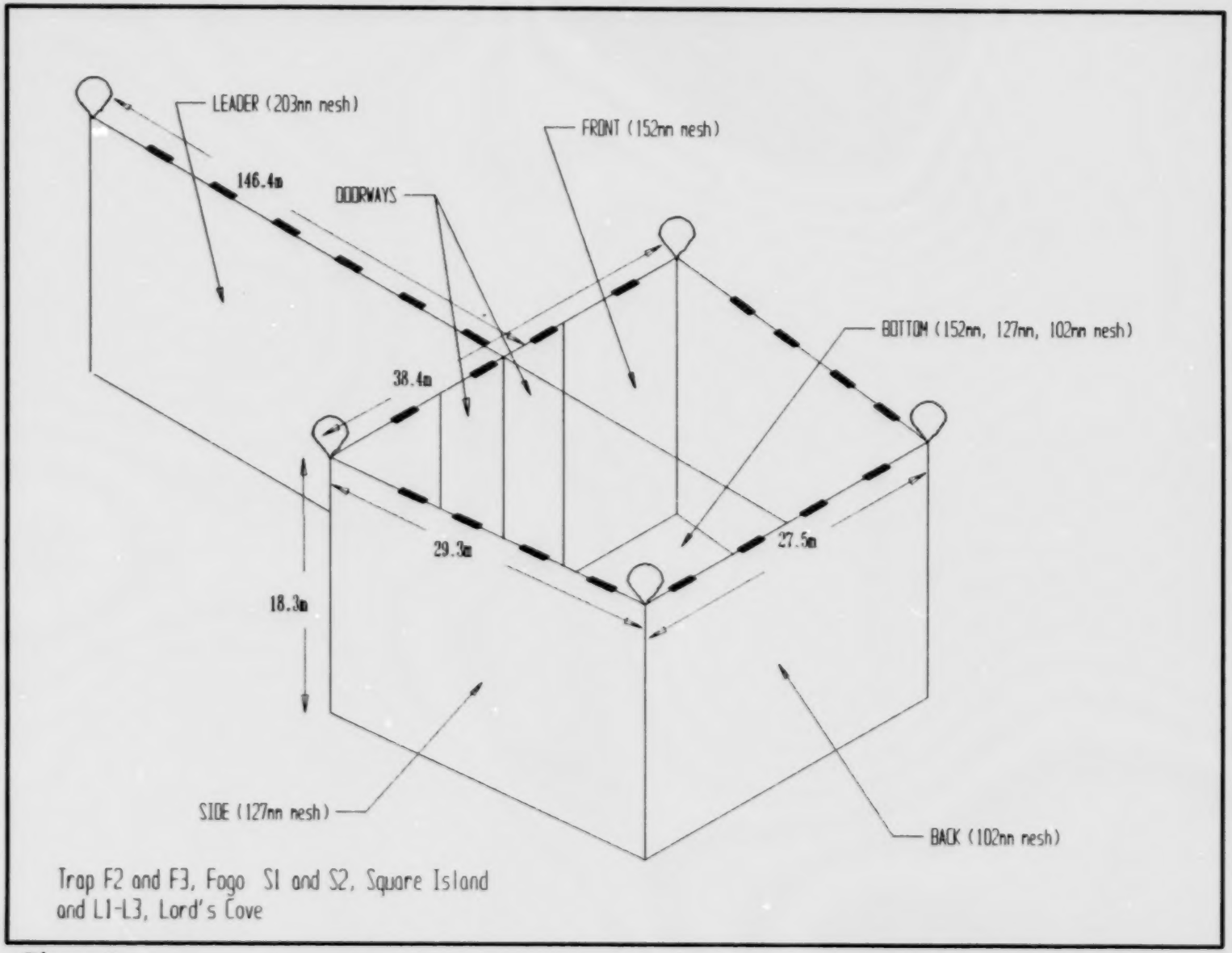


Figure 9

JAPANESE COD TRAP

(Model 69)

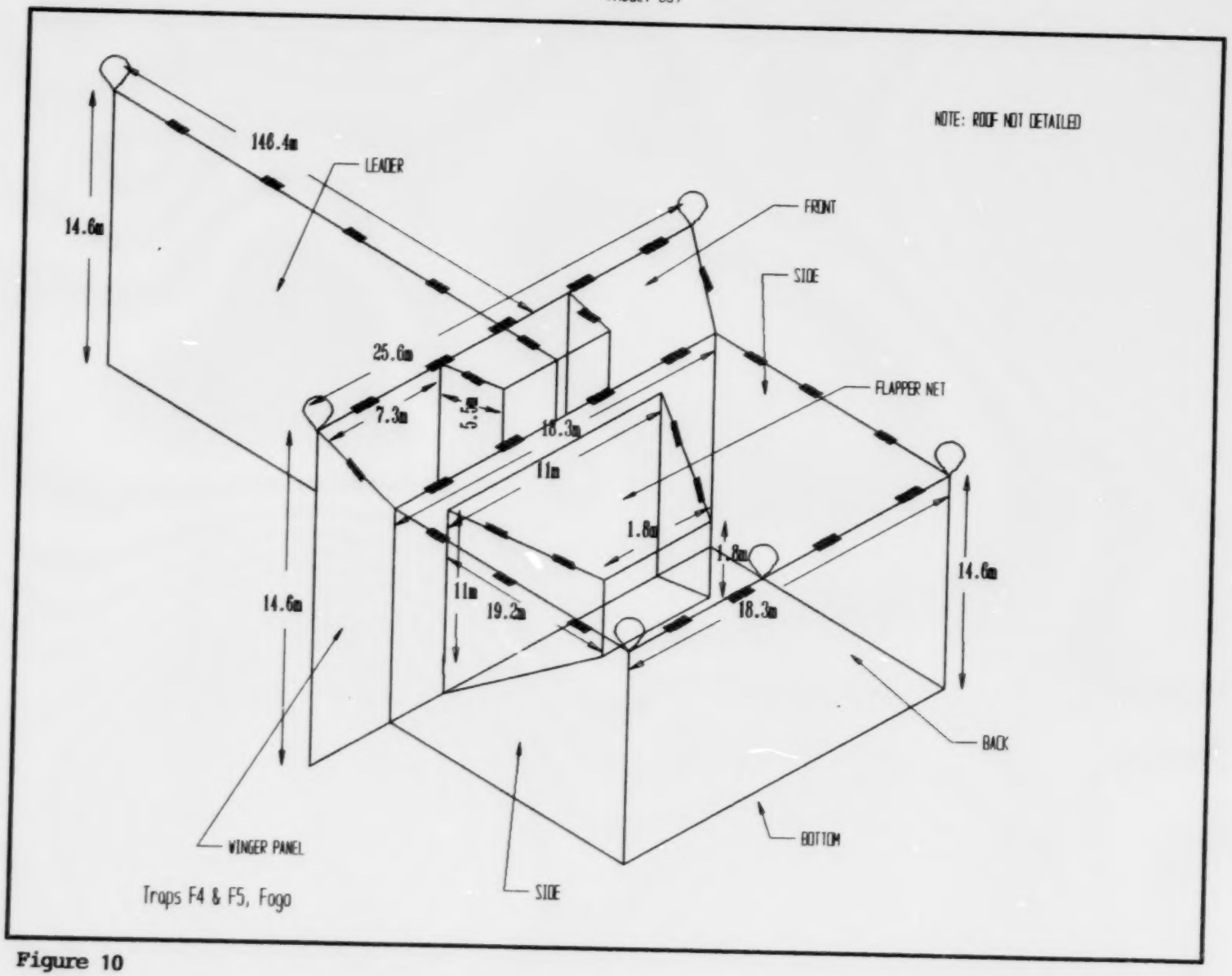
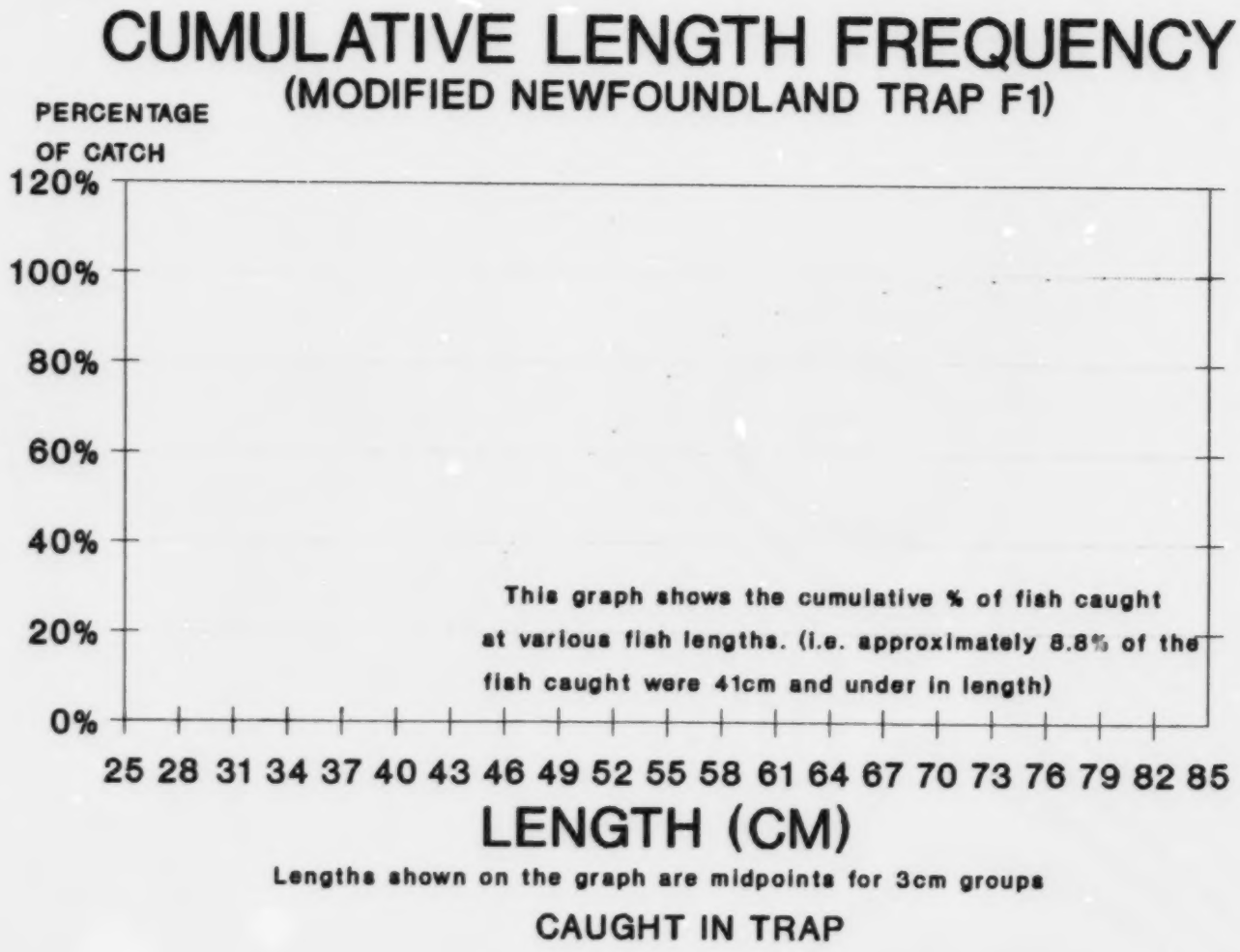
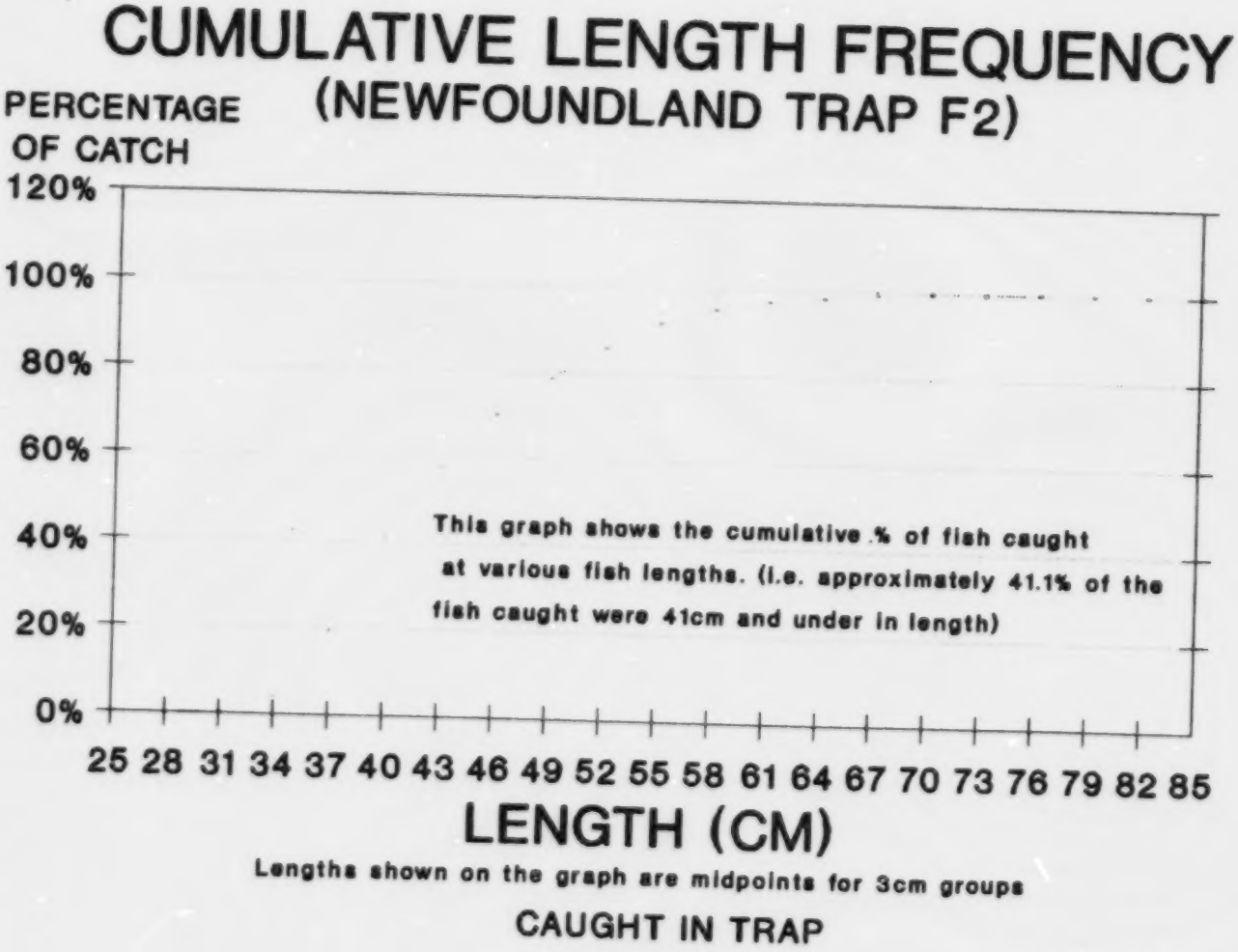


Figure 10


CUMULATIVE LENGTH FREQUENCY
(MODIFIED NEWFOUNDLAND TRAP F1)
PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 8.8% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

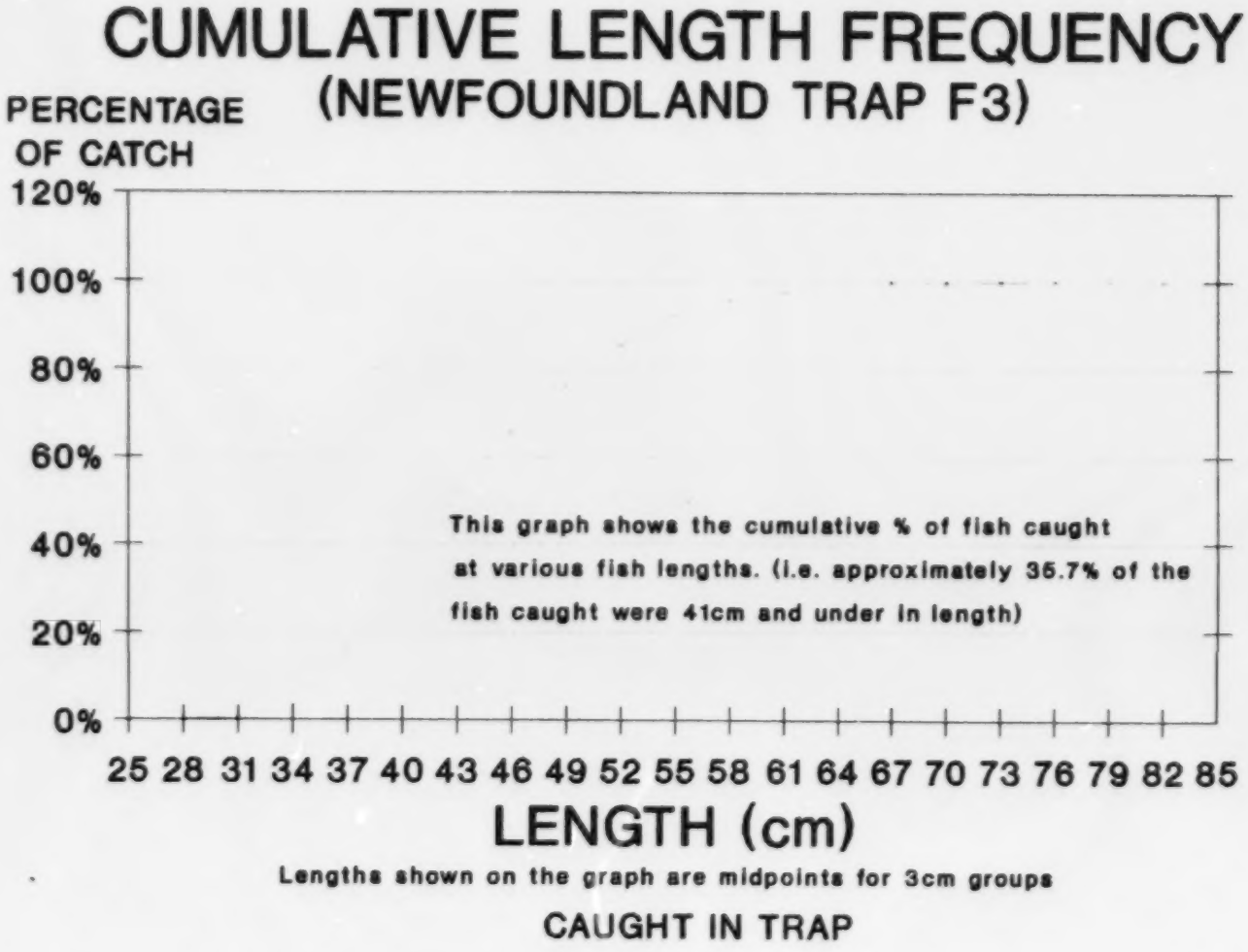
TRAP DIMENSIONS:
102mm MESH

Figure 11


CUMULATIVE LENGTH FREQUENCY
(NEWFOUNDLAND TRAP F2)
PERCENTAGE OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 41.1% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

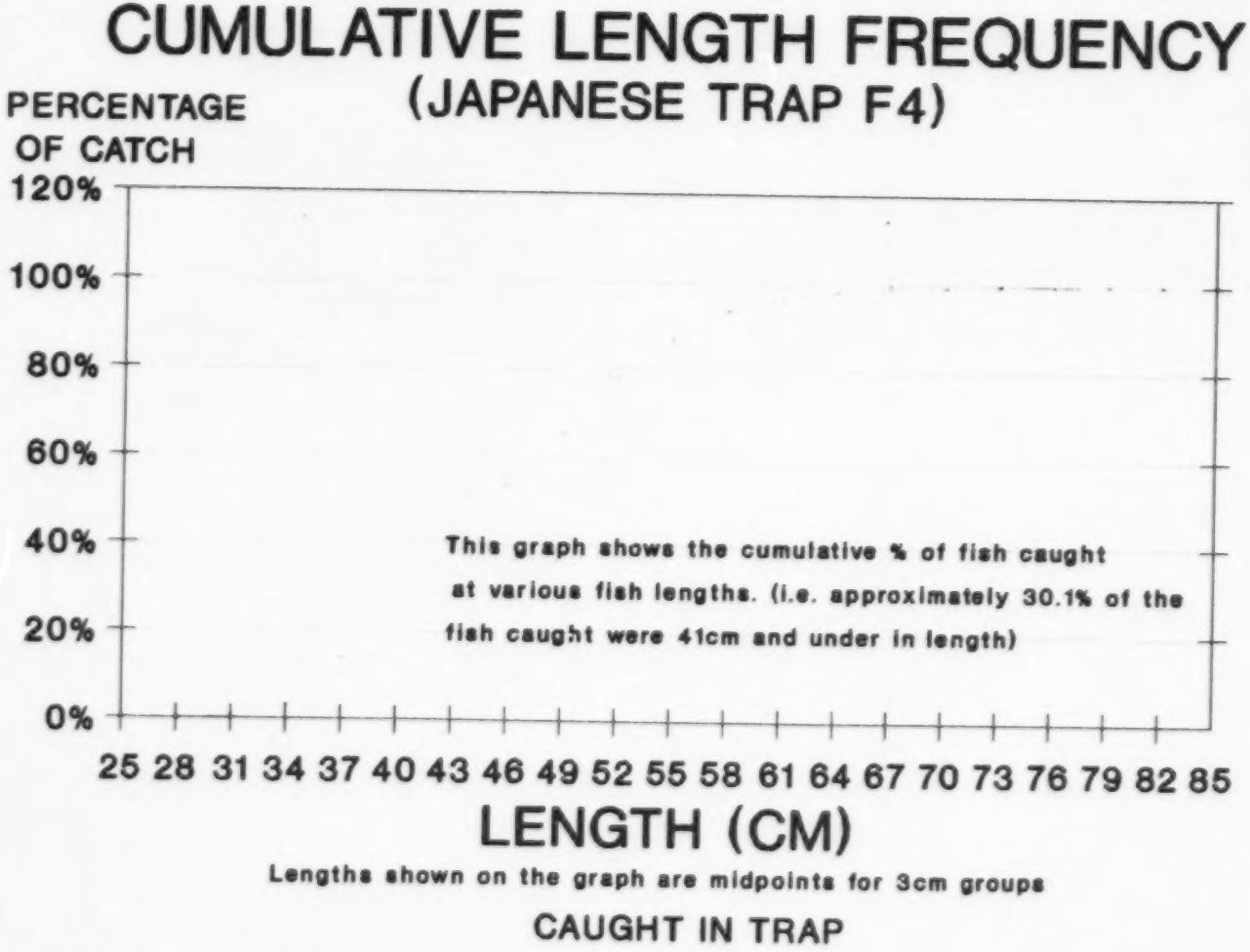
TRAP DIMENSIONS:
102mm MESH

Figure 12


CUMULATIVE LENGTH FREQUENCY
(NEWFOUNDLAND TRAP F3)
PERCENTAGE OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 35.7% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (cm)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH

Figure 13


CUMULATIVE LENGTH FREQUENCY
(JAPANESE TRAP F4)
PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 30.1% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH

Figure 14

CUMULATIVE LENGTH FREQUENCY
(JAPANESE TRAP F5)

PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 39.3% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH

Figure 15

LENGTH FREQUENCY

F1-102mm,F2-102mm,F3-92mm

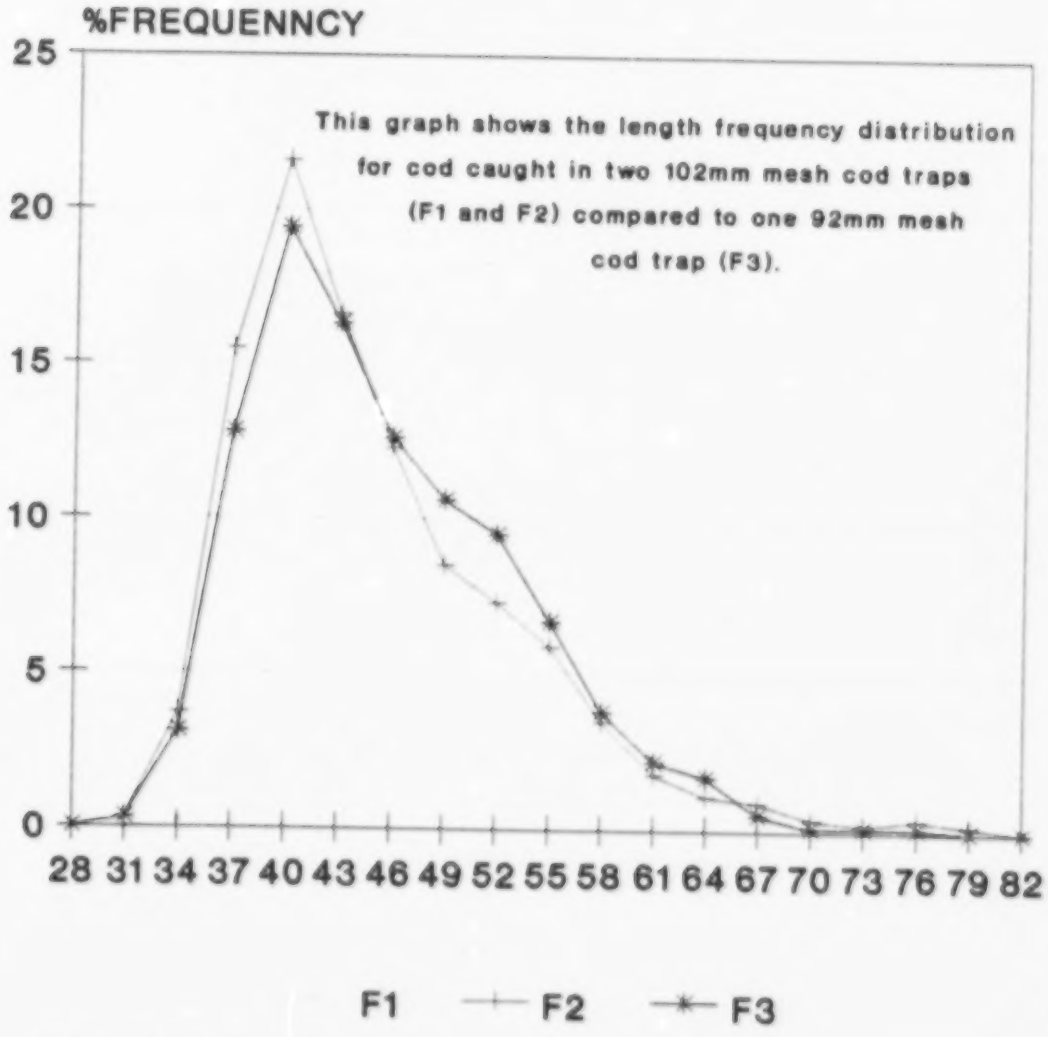

%FREQUENNCY
25
20
15
10
5
0
This graph shows the length frequency distribution for cod caught in two 102mm mesh cod traps (F1 and F2) compared to one 92mm mesh cod trap (F3).
28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82
F1
F2
F3

Figure 16

LENGTH FREQUENCY

P1, F4 AND F5

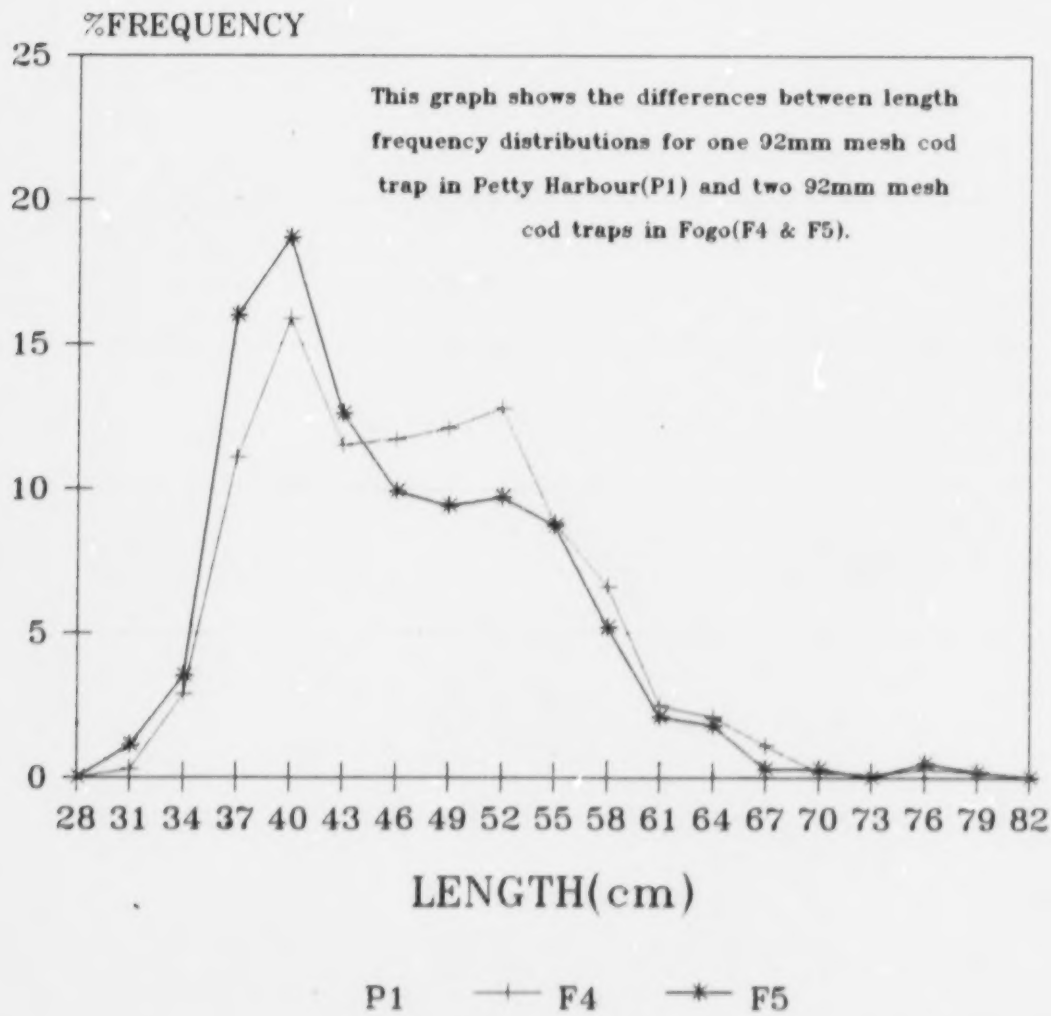

%FREQUENCY
25
20
15
10
5
0
This graph shows the differences between length frequency distributions for one 92mm mesh cod trap in Petty Harbour(P1) and two 92mm mesh cod traps in Fogo(F4 & F5).
28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82
LENGTH(cm)
P1
F4
F5

Figure 17

4.4 LOCATION: SQUARE ISLAND, LABRADOR

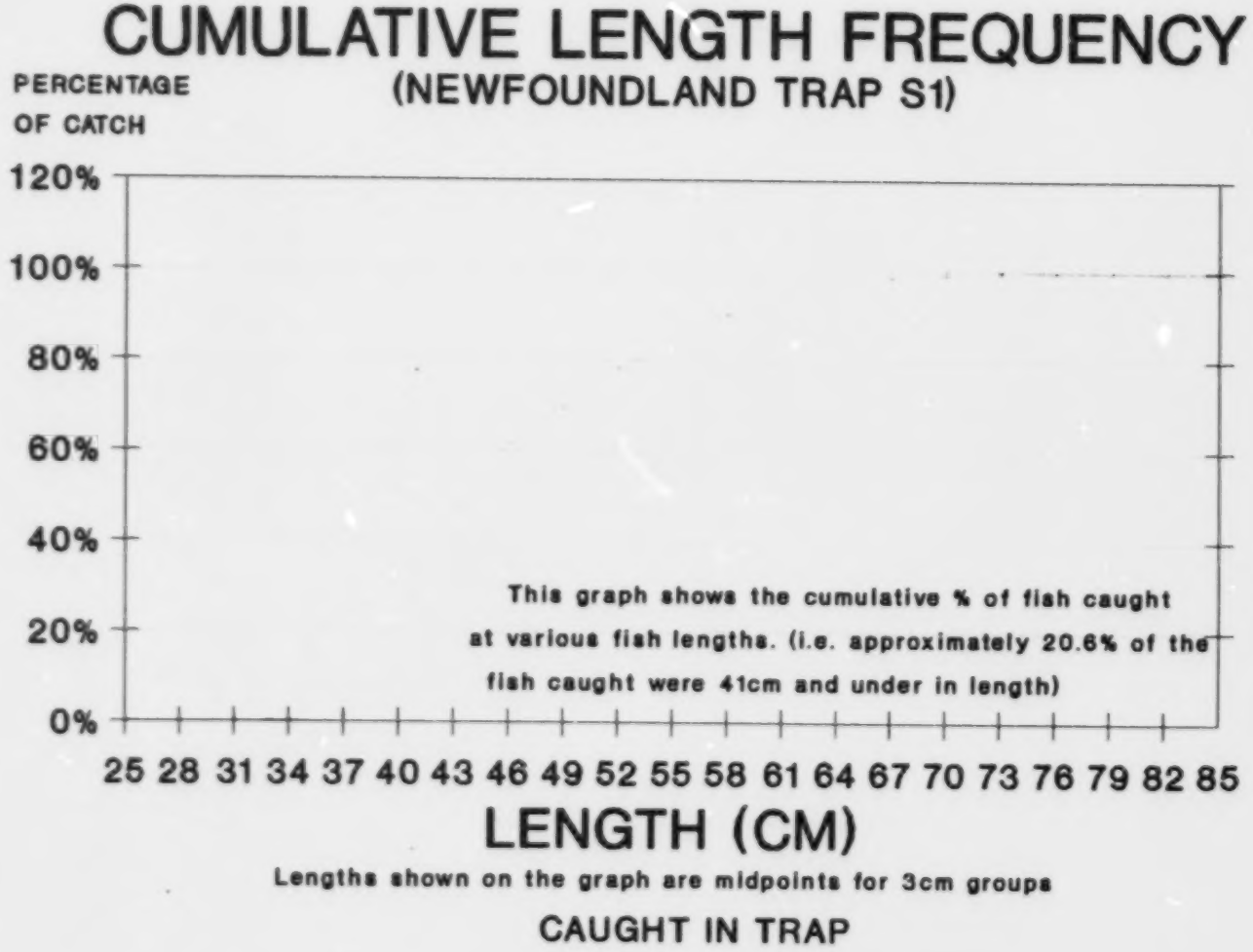
The two traps monitored in Square Islands were both Newfoundland cod traps (S1 and S2) (Figure 9). Both traps had 92mm mesh in the backs, and 178mm mesh in the sides. S1 was 25 meters deep, while S2 was 22 meters deep.

The two traps were fished from August 16th to September 28th. The traps caught 9,280 kgs and 8,512 kgs of cod, respectively.

The water at Square Island was dirty throughout the monitoring period. The average length of fish caught in the two traps was 52.74cm and 53.45cm, while the average length of fish meshed in the drying twine was 41.87cm and 42.03cm (Table 5). The project indicated that the distribution of fish size in the berths around Square Island were larger compared to all other areas monitored, or many of the small fish (41cm and under), escaped through the large mesh (178mm) in the trap sides.

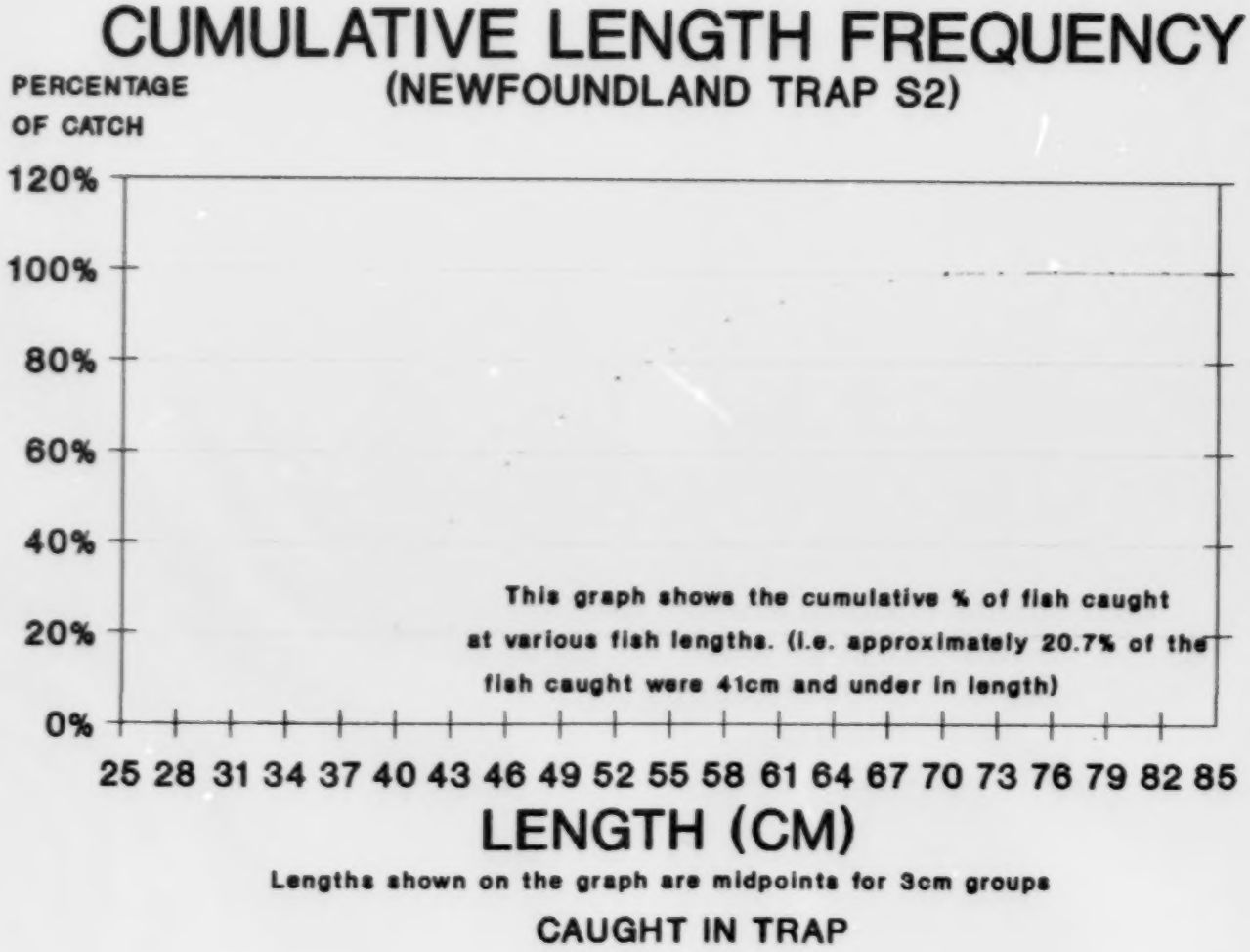
The two traps averaged 20.8 and 20.7% (Table 4) of their catch 41cm and under, most of which was meshed in the back. Figures 18 and 19 shows the cumulative percent of fish caught at various lengths.

Figure 20 compares the length frequency distribution of cod caught in traps S1 and S2 to the total catch of both traps. The percent of fish caught at different lengths varied very little between the two traps.


CUMULATIVE LENGTH FREQUENCY
(NEWFOUNDLAND TRAP S1)
PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught
at various fish lengths. (i.e. approximately 20.6% of the
fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH

Figure 18


CUMULATIVE LENGTH FREQUENCY
(NEWFOUNDLAND TRAP S2)
PERCENTAGE
OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 20.7% of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH

Figure 19

LENGTH FREQUENCY
S1 AND S2
BOTH TRAPS 92mm

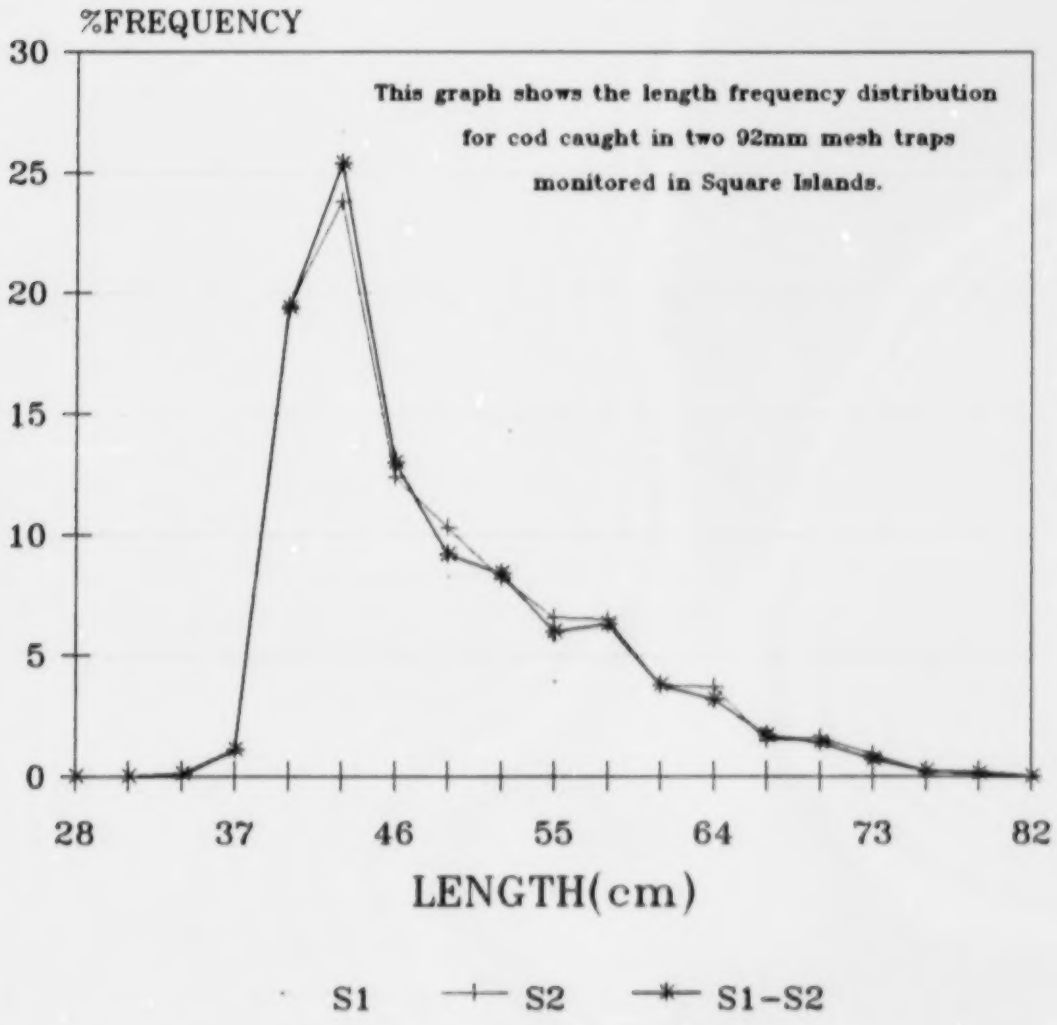


Figure 20

4.5 LOCATION: TORBAY

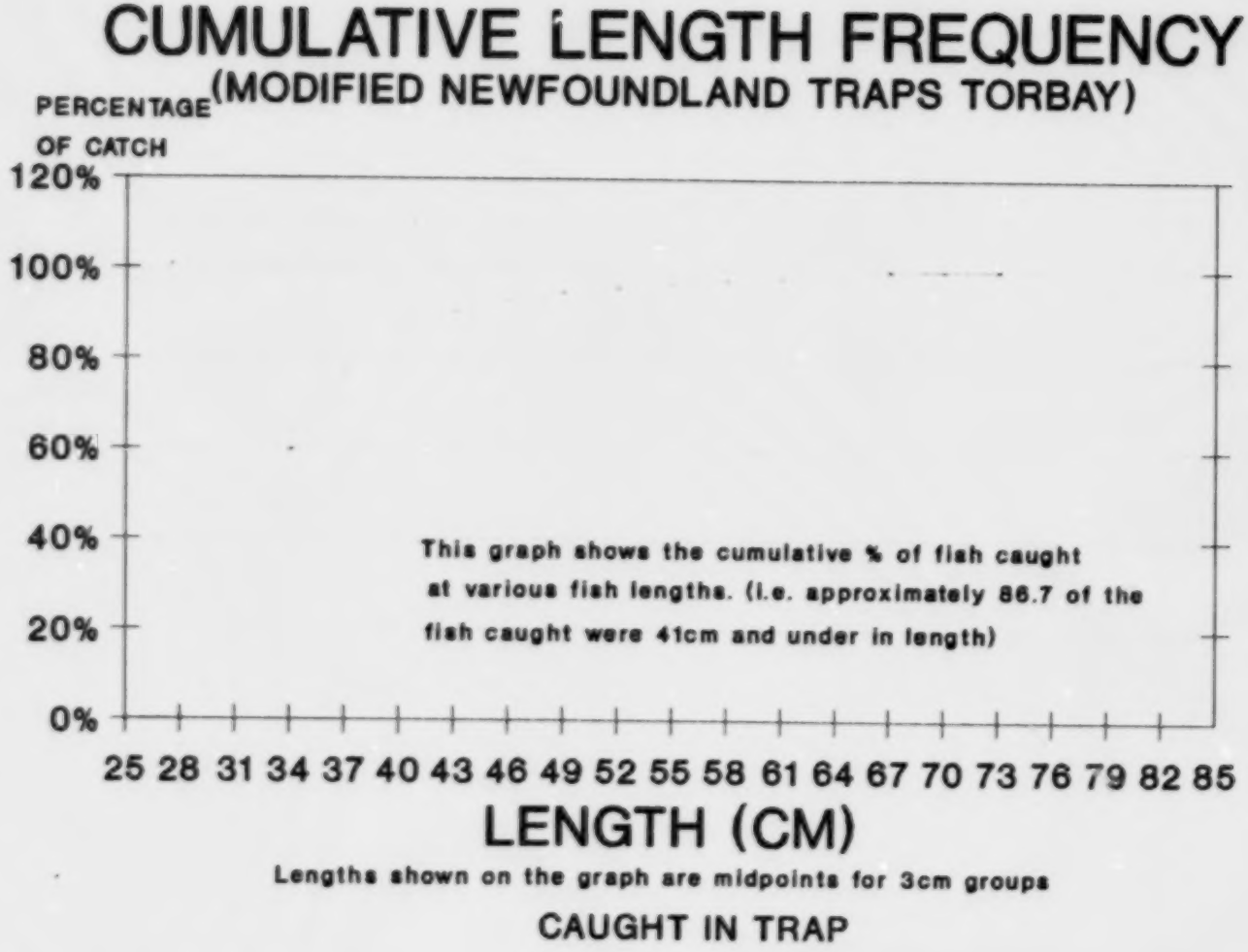
Six (6) modified Newfoundland traps (T1 - T6, Figure 8) with 92mm mesh in the back and sides of all the traps were fished to provide information on the size of fish trapped and meshed in various trap berths around Torbay. The depth of the traps varied; two 20 meters, one 22 meters, one 25 meters, and two 27 meters. Each trap was set in water which was 4 to 6 meters deeper than the trap.

The six modified Newfoundland cod traps were fished from July 22nd to August 22nd in the Torbay area. The traps caught a total weight of 362,926 kgs. of cod. Since the six traps used were all Modified Newfoundland traps with the same mesh sizes, the results from each trap were combined.

The tide in the Torbay area was very strong during this project. The smallest run of fish caught during the study were taken from the Torbay area. The average length of fish caught was 37.05cm (Table 3). The fish which meshed in the drying twine averaged 35.63cm (Table 5) 86.7 percent of the fish which were caught by the traps were 41cm and under (Table 4). Figure 21 shows the cumulative percent of fish caught at various lengths.

The results of the project indicate that the distribution of fish size in the berths around Torbay were small in relation to other areas participating in this project and possibly that the use of tar as a preservative may also have a significant impact on selectivity.

Figure 22 compares the length frequency distribution of cod caught by all six traps monitored in Torbay. The percent of fish caught at different lengths varied very little between the traps.


CUMULATIVE LENGTH FREQUENCY
(MODIFIED NEWFOUNDLAND TRAPS TORBAY)
PERCENTAGE OF CATCH
120%
100%
80%
60%
40%
20%
0%
This graph shows the cumulative % of fish caught at various fish lengths. (i.e. approximately 86.7 of the fish caught were 41cm and under in length)
25 28 31 34 37 40 43 46 49 52 55 58 61 64 67 70 73 76 79 82 85
LENGTH (CM)
Lengths shown on the graph are midpoints for 3cm groups
CAUGHT IN TRAP

TRAP DIMENSIONS:
92mm MESH IN BACK & SIDES

Figure 21

LENGTH FREQUENCY

ALL 92mm MESH

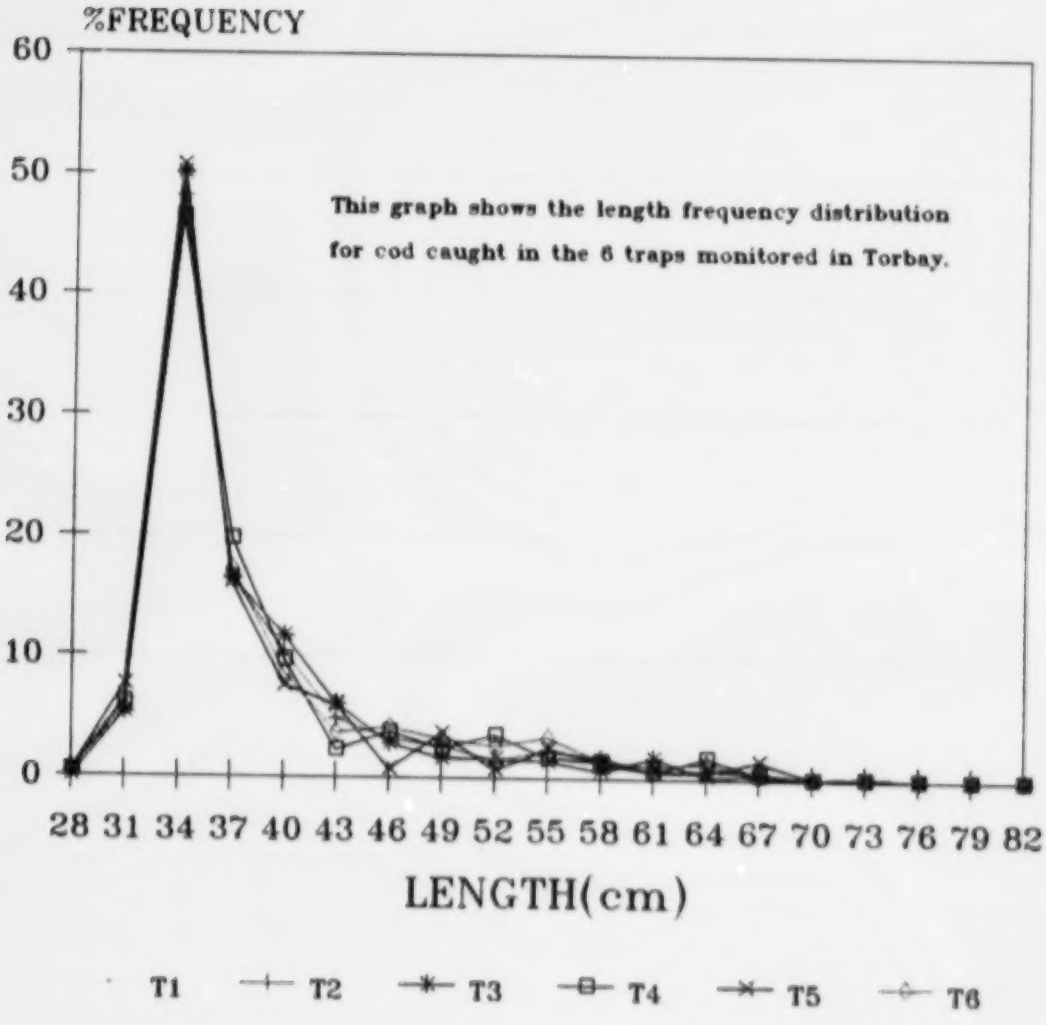


Figure 22

4.6 LOCATION: LORD'S COVE

Three Newfoundland traps (L1 - L3, Figure 9) with 92mm mesh throughout were fished in order to collect data on the amount and size of fish caught and meshed in berths around Lord's Cove.

The three traps in Lord's Cove had a catch of only 59 kgs. of cod (Table 2). The data collected were insufficient to allow any meaningful analysis to be completed concerning the size of fish trapped and meshed in the area.

5.0 Discussion of Results

Low catch rates were experienced in all areas during this study. In Lord's Cove, insufficient data were collected to provide the basis for any meaningful statistical analysis. The other five areas were examined to analyze the effect of mesh size on trap catches and the size of the fish meshing in cod traps. Underwater observations of the traps showed that most of the fish concentrate within the traps and mesh or escape only when the cod trap was being hauled (dried-up).

5.1 Reductions In Small Fish

Study results indicate that a 102mm mesh is a more effective mesh size for reducing the catch of small fish than a 92mm mesh. In all areas where the study compared the different mesh sizes, the 102mm mesh was consistently more selective at releasing small fish.

54.3 percent of the fish caught by the 92mm mesh Japanese trap ("D" type) in Petty Harbour was 41cm and under (Figure 3), while 39.8 percent of the fish caught in the 102mm mesh trap was 41cm and under (Figure 4).

Only 5 percent of the fish caught by the 102mm mesh Japanese trap (Model 69) in Renews was 41cm and under (Figure 7).

The average length of fish caught in the 102mm mesh Japanese trap (D-Type) in Petty Harbour was 8.97cm smaller than the average length of fish caught in the 102mm mesh Japanese trap in Renews. Factors which may have influenced this discrepancy are as follows:

1. The design of the D-Type Japanese trap used in Petty Harbour is much different than the standard Japanese trap used in Renews. The D-Type trap is 14.6 meters deep in the front and 11 meters deep in the back. The bottom of the winker panel in the front of the trap is tapered 3.6 meters up from the bottom. The bottom of the trap box is completely off the bottom and many of the fish caught were meshed in the 76mm bottom.
2. The Petty Harbour trap had retainers on both sides an on the back. Crewmen observed small fish swimming into the retainers and returning into the trap. The Renews trap only had a 76mm mesh retainer attached to the 102mm back. The sides and bottom of the trap were 76mm mesh.
3. The average size of fish caught in the retainer of the 102mm mesh Petty Harbour trap was smaller than the average size of fish caught in the retainer of the 102mm mesh Renews trap. This indicates that the length of fish in the Petty Harbour area and available to the traps to catch was smaller than the average fish size in the Renews area.

5.2 Meshed Fish

Fish meshing in the drying twine has always been a problem for fishermen hauling cod traps.

The results of this study indicate that the problem of fish meshing in the different mesh sizes appears to be affected by the size distribution of fish in the location. 50% of the fish which meshed in traps with 102mm mesh in the back, and larger in the sides (F1 and

F2) were 41cm and under (Appendix A4 and A5), while 94% of the fish which meshed in traps with 92mm mesh throughout (P1, F4, F5 and T) were 41cm and under (Appendix A1, A7, A8 and A11). The fish which meshed in the 102mm mesh ranged from 31cm to 61cm, while the fish which meshed in the 92mm mesh ranged from 28cm to 64cm. This would account for the high amounts of meshed fish in the 102mm mesh trap in Renews (average meshed fish length was 46.9cm). The average fish length meshed in the 92mm traps in Torbay was 35.6cm (Table 5). They were the smallest fish meshed in all areas monitored. The 102mm mesh did not mesh more fish, just fish of a different size as one would expect.

5.3 Estimated Losses To Fishermen

For a given fisherman, the actual level of catch reduction resulting from increasing the minimum mesh size of cod traps beyond 92mm mesh would depend on the size distribution of the population of fish that move to the trap berths. Certain locations are known to get a small run of fish and would experience large catch reductions if the minimum mesh size in cod traps was increased. Other areas are known to get a large run of fish and would not be significantly affected by an increase in the minimum mesh size.

The study revealed that 40% (weight) of the fish which entered the 102mm mesh cod trap in Renews escaped and 32.5% (weight) of the fish which entered the 102mm mesh cod trap in Petty Harbour escaped (Table 2). However, only 1.6% (weight) of the fish which entered the 92mm mesh cod trap in Petty Harbour escaped (Table 2). Petty Harbour and Renews were the only areas where cod traps were equipped with retainers which allowed monitoring the amount of fish which escaped. The percentage decrease in total revenue will

be somewhat less than the percentage decline in volume. This results from a certain portion of the lost catch being fish currently discarded or sold at a relatively low price as small or extra small. If the proportion of small fish taken by traps decreased significantly and catches were graded by size, it could result in trap fishermen receiving a higher price for a traditionally low priced commodity.

5.4 The Impacts of Reducing Small Fish Landings

The current state of the inshore fishery (decreased landings and declining stocks) has caused much speculation and concern about the future of this fishery. All factions of the fishing industry must be concerned with any alternatives that promote conservation of cod fish stocks.

Cod traps have traditionally landed over 60% of their catch small cod. Table 6 shows the catch of small (3 to 5 years old) 2J3KL cod as a percentage of total catch by gear type.

In 1989, of the 36,461 mt of cod fish trapped in NAFO Divisions 2J3KL, 17,074mt (47%) of this catch were fish under 40cm. Table 7 shows the percentage of small cod caught by each gear type in the inshore fishery.

This large proportion of small fish caught by cod traps has prompted the consideration of introducing minimum fish sizes for cod traps. Presently, no fishing gears except cod traps are permitted to retain fish under 40cm. The introduction of a larger minimum fish size for cod traps would be aimed at meeting three objectives:

1) to allow the average size of fish stock to increase,

2) to increase the spawning stock biomass,

3) to maximize the weight yield from the available harvest,

TABLE 6

CATCH OF SMALL (3 to 5 YEARS OLD) COD AS A PERCENTAGE OF TOTAL CATCH BY GEAR

Gear Type	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Offshore Otter Trawls	39	18	22	38	30	29	27	21	8	15
Cod Traps	71	66	82	78	66	68	75	62	60	63
Handlines	50	32	50	63	51	49	63	57	48	45
Longlines	34	25	51	51	57	48	63	48	51	63
Gillnets	10	9	7	14	13	7	10	10	5	6

[1] Catch is measured in terms of the total number of small fish caught.

TABLE 7

PERCENTAGES OF ESTIMATED 1989 INSHORE CATCHES OF SMALL* NORTHERN COD, BY GEAR SECTOR

CATCH WEIGHT

NAFO DIVISION	GILLNETS	TRAPS	HAND LINES	LINE TRAWLS	TOTAL
2J	3.0	23.5	17.3	10.0	9.9
3K	3.2	42.3	27.2	14.8	23.3
3L	4.0	54.7	31.8	31.9	30.8
2J3KL	3.5	46.8	29.2	29.0	24.8

(Graphs: Econ.Imp.Red.Sml.Cod, Pg:22)

* In the above table, small cod refers to fish five years of age and under, which is approximately 43cm (standard length) in length.

6.0 Conclusions

1. The 1991 study in Petty Harbour and Renews showed that increasing the mesh size in cod traps from 92mm to 102mm mesh would result in decreased landings from 32.5% to 40%.

2. 26.4% of the fish caught in cod traps with mesh size 102mm in the back and larger in the sides was fish 41 cm and under, while 77.7% of the fish caught in cod traps with mesh size 92mm throughout was fish 41 cm and under.

3. Fish which passed through the 102mm mesh was between 2.7 cm and 4 cm larger than the fish which passed through the 92mm mesh.

4. 69% of the fish which passed through the 102mm mesh was fish 41 cm and under.

5. The average size of fish caught in cod traps with 92mm mesh in the drying twine, and larger in the back was similar to the size of fish caught in cod traps with 102mm throughout; 47.46 cm compared to 47.73 cm respectively.

7.0 Acknowledgements

Sincere appreciation is expressed to the skippers and crews of the six vessels which participated in the project and without whom this study would not have been possible. They were as follows: Tom Best and crew, Petty Harbour; Charlie Kane and crew, Renews; Clarence Ford and crew, Fogo; Lewis Cadwell and crew, Square Islands; Bernard Manning and crew, Torbay; and Peter Hennebury and crew, Lord's Cove.

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The Project Co-ordinator for this project was Jack Sheppard, a Cooperative Engineering Student from Memorial University. His dedication and leadership was largely responsible for the quality and quantity of data received from the study.

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Appendix A: Length Frequency Results

TABLE NO: A1

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Japanese Trap - 92mm mesh in back & sides, 64mm mesh in retainer

LOCATION: Petty Harbour (P1)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN BOTTOM	SECTION D # OF FISH TRAPPED IN RETAINER	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	24	13	37
31	8	0	65	28	101
34	38	11	206	56	311
37	114	32	120	39	305
40	176	99	20	26	321
43	132	85	5	15	237
46	67	15	1	7	90
49	42	3	0	2	47
52	33	0	0	1	34
55	11	0	0	0	11
58	8	0	0	0	8
61	6	0	0	0	6
64	1	0	0	0	1
67	0	0	0	0	0
70	0	0	0	0	0
73	0	0	0	0	0
76	0	0	0	0	0
79	0	0	0	0	0
82	0	0	0	0	0
TOTAL # IN SAMPLE	636	245	441	187	1509
AVERAGE LENGTH (cm)	42.18	40.86	34.45	36.02	38.94
TOTAL SAMPLE WEIGHT (kgs)	465	158	183	98	904
TOTAL CATCH WEIGHT (kgs)	10335				

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A2

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Japanese Trap - 102mm mesh in back & sides, 64mm mesh in retainer

LOCATION: Petty Harbour (P2)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN BOTTOM	SECTION D # OF FISH TRAPPED IN RETAINER	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	1	5	6
31	9	8	134	59	210
34	131	2	459	155	747
37	329	25	416	228	998
40	317	57	43	224	641
43	239	200	4	140	583
46	215	293	0	72	580
49	118	129	0	20	267
52	69	5	0	3	77
55	33	0	0	0	33
58	11	0	0	0	11
61	12	0	0	0	12
64	5	0	0	0	5
67	0	0	0	0	0
70	0	0	0	0	0
73	0	0	0	0	0
76	0	0	0	0	0
79	0	0	0	0	0
82	0	0	0	0	0
TOTAL # IN SAMPLE	1488	719	1057	906	4170
AVERAGE LENGTH (cm)	42.09	44.76	35.07	38.71	40.04
TOTAL SAMPLE WEIGHT (kgs)	908	573	438	512	2431
TOTAL CATCH WEIGHT (kgs)	18874				

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A3

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Japanese Trap - 102mm mesh in back & sides, 76mm mesh in retainer

LOCATION: Renews (R1)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	SECTION D # OF FISH TRAPPED IN RETAINER	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0	0
31	0	0	0	0	0
34	0	0	0	133	133
37	0	4	0	247	251
40	19	75	0	296	390
43	59	224	0	214	497
46	88	226	0	117	431
49	131	253	0	31	415
52	101	92	0	2	195
55	114	48	0	0	162
58	140	11	0	0	151
61	102	9	0	0	111
64	130	0	0	0	130
67	52	0	0	0	52
70	41	0	0	0	41
73	29	0	0	0	29
76	23	0	0	0	23
79	0	0	0	0	0
82	0	0	0	0	0
TOTAL # IN SAMPLE	1029	943	0	1040	3011
AVERAGE LENGTH (cm)	56.53	46.90	0	40.10	47.84
TOTAL SAMPLE WEIGHT (kgs)	1844	1318	0	1055	4217
TOTAL CATCH WEIGHT (kgs)	31729				

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A4

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Modified Newfoundland trap - 102mm mesh in back with 102, 127 & 152mm mesh in sides

LOCATION: Fogo (F1)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0
31	0	2	0	2
34	0	9	0	9
37	14	67	0	81
40	80	211	0	291
43	136	388	0	524
46	324	405	0	729
49	454	214	0	668
52	445	68	0	513
55	506	21	3	530
58	388	8	5	401
61	226	2	10	238
64	132	0	5	137
67	77	0	3	80
70	58	0	3	61
73	46	0	0	46
76	34	0	0	34
79	12	0	0	12
82	5	0	0	5
TOTAL # IN SAMPLE	2937	1395	29	4361
AVERAGE LENGTH (cm)	54.12	44.71	61.93	51.36
TOTAL SAMPLE WEIGHT (kgs)	3460	930	55	4445
TOTAL CATCH WEIGHT (kgs)	6124			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A5

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Newfoundland trap - 102mm mesh in back with 102, 127 & 152mm mesh in sides

LOCATION: Fogo (FI)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0
31	6	10	0	16
34	43	149	0	192
37	181	622	0	803
40	336	783	0	1119
43	444	416	0	860
46	415	222	0	637
49	406	37	0	443
52	369	7	0	376
55	301	3	0	304
58	181	0	0	181
61	92	0	0	92
64	57	0	0	57
67	47	0	0	47
70	19	0	0	19
73	11	0	0	11
76	19	0	0	19
79	10	0	0	10
82	0	0	0	0
TOTAL # IN SAMPLE	**2937**	**2249**	**0**	**5186**
AVERAGE LENGTH (cm)	**42.63**	**40.89**	**0**	**49.93**
TOTAL SAMPLE WEIGHT (kgs)	**2849**	**1291**	**0**	**4140**
TOTAL CATCH WEIGHT (kgs)	**5737**			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A6

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Newfoundland trap - 92mm mesh in back with 102, 127 & 152mm mesh in sides

LOCATION: Fogo (F3)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MISSED IN BACK	SECTION C # OF FISH MISSED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0
31	5	9	0	14
34	27	100	0	127
37	133	384	0	517
40	254	531	1	786
43	321	338	0	659
46	365	145	1	511
49	416	9	2	427
52	377	3	4	384
55	257	2	14	273
58	138	0	15	153
61	80	0	10	90
64	65	0	3	68
67	20	0	0	20
70	5	0	1	6
73	6	0	0	6
76	6	0	0	6
79	0	0	0	0
82	0	0	0	0
TOTAL # IN SAMPLE	2455	1541	51	4047
AVERAGE LENGTH (cm)	48.76	40.13	56.94	45.57
TOTAL SAMPLE WEIGHT (kgs)	2085	833	78	3015
TOTAL CATCH WEIGHT (kgs)	3444			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A7

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Japanese Trap - 92mm mesh in back & sides

LOCATION: Fogo (F4)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0
31	0	9	0	9
34	9	93	0	102
37	73	323	0	396
40	127	441	0	568
43	164	246	0	410
46	316	100	0	416
49	405	26	0	431
52	454	4	0	458
55	313	2	0	315
58	232	2	0	234
61	89	0	0	89
64	75	1	0	76
67	37	0	0	37
70	7	0	0	7
73	4	0	0	4
76	12	0	0	12
79	6	0	0	6
82	0	0	0	0
TOTAL # IN SAMPLE	2333	1347	0	3570
AVERAGE LENGTH (cm)	51.09	40.08	0	47.24
TOTAL SAMPLE WEIGHT (kgs)	2566	746	0	3312
TOTAL CATCH WEIGHT (kgs)	5633			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A8

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Japanese Trap - 92mm mesh in back & sides

LOCATION: Fogo (F5)

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0
31	1	28	0	29
34	14	78	0	92
37	115	303	0	418
40	176	311	0	487
43	169	159	0	328
46	185	73	0	258
49	230	16	0	246
52	252	0	0	252
55	225	1	0	226
58	135	0	0	135
61	55	0	0	55
64	46	0	0	46
67	9	0	0	9
70	9	0	0	9
73	1	0	0	1
76	12	0	0	12
79	6	0	0	6
82	0	0	0	0
TOTAL # IN SAMPLE	1640	969	0	2609
AVERAGE LENGTH (cm)	49.48	39.43	0	45.75
TOTAL SAMPLE WEIGHT (kgs)	1643	616	0	2259
TOTAL CATCH WEIGHT (kgs)	6022			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A9

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Newfoundland Trap - 92mm mesh in back & 178mm mesh in sides

LOCATION: Square Island - 81

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0
31	0	0	0	0
34	0	11	0	11
37	8	86	0	94
40	47	1687	0	1734
43	438	1955	0	2393
46	861	344	0	1205
49	737	2	0	739
52	760	1	0	761
55	699	0	0	699
58	555	0	0	555
61	341	0	0	341
64	254	0	2	256
67	160	0	7	167
70	63	0	57	120
73	39	0	19	58
76	5	0	5	10
79	5	0	2	7
82	0	0	3	3
TOTAL # IN SAMPLE	4772	4086	95	8953
AVERAGE LENGTH (cm)	52.74	41.87	70.83	47.97
TOTAL SAMPLE WEIGHT (kgs)	7369	1980	348	9697
TOTAL CATCH WEIGHT (kgs)	9280			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A10

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Newfoundland Trap - 92mm mesh in back & 178mm mesh in sides

LOCATION: Square Island - S2

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	0	0	0	0
31	0	0	0	0
34	0	2	0	2
37	6	72	0	78
40	78	1349	0	1427
43	281	1466	0	1747
46	499	409	0	908
49	744	10	0	754
52	600	0	0	600
55	483	0	0	483
58	670	0	0	670
61	276	0	0	276
64	266	0	2	268
67	103	0	4	107
70	95	0	20	115
73	40	0	23	63
76	10	0	5	15
79	7	0	6	13
82	0	0	1	1
TOTAL # IN SAMPLE	3967	3308	61	7336
AVERAGE LENGTH (cm)	53.45	42.83	72.31	48.46
TOTAL SAMPLE WEIGHT (kgs)	5930	1606	154	7680
TOTAL CATCH WEIGHT (kgs)	8013			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

TABLE NO: A11

LENGTH FREQUENCY RESULTS

TYPE OF TRAP: Modified Newfoundland Trap - 92mm mesh in back & sides

LOCATION: Torbay - All traps

FORK LENGTH (cm)	SECTION A # OF FISH TRAPPED IN BOX	SECTION B # OF FISH MESHED IN BACK	SECTION C # OF FISH MESHED IN SIDES	TOTAL # OF FISH IN EACH CATEGORY
28	150	5	0	155
31	1434	723	0	2157
34	7055	9093	0	16148
37	1056	4353	0	5409
40	719	2168	0	2887
43	953	285	203	1441
46	655	12	122	789
49	681	10	56	747
52	333	0	101	434
55	277	22	500	799
58	194	0	121	315
61	210	0	45	255
64	210	0	9	219
67	196	0	6	202
70	94	0	2	96
73	28	0	0	28
76	1	0	0	1
79	0	0	0	0
82	0	0	0	0
TOTAL # IN SAMPLE	14196	16671	1168	32043
AVERAGE LENGTH (cm)	38.70	35.63	52.19	37.60
TOTAL SAMPLE WEIGHT (kgs)	9643	10697	2399	22739
TOTAL CATCH WEIGHT (kgs)	362936			

NOTE: Lengths shown on this table are midpoints for 3cm groups.

Appendix B: Length Frequency Forms

COD TRAP MESH SIZE SELECTIVITY PROJECT: LOG SHEET

MONITOR:	VESSEL OWNER:	DATE:	TIME:
LOCATION:	TRAP TYPE:	DEPTH:	

LENGTH	SECTION A	SECTION B	SECTION C	TOTALS
< 30				
30 - 32				
33 - 35				
36 - 38				
39 - 41				
42 - 44				
45 - 47				
48 - 50				
51 - 53				
54 - 56				
57 - 59				
60 - 62				
63 - 65				
66 - 68				
69 - 71				
72 - 74				
75 - 77				
78 - 80				
> 80				
TOTAL				
WEIGHT				

COMMENTS: